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ECODRIVE

DKC01.1/DKC11.1 Drive Controllers

Functional Description: ASE 04VRS

DOK-ECODRV-ASE-04VRS**-FKB1-EN-P

275270

Indramat

Title	ECODRIVE DKC01 .1/ DKC11.1 Drive Controllers 04VRS
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What is the purpose of this documentation?

The following document describes the functions of the fimware FWA-ECODRV-ASE-04VRS-MS.

The document serves:

- to describe all of the functional characteristics.
- for parameterization of the drive controller.
- for data security of the drive parameter
- for error diagnosis and error removal

Change Notice

Document identification of previous and current releases	Release Date	Remarks
DOK-ECODRV-ASE-04VRS**-FKB1-EN-P	07.97	First Release

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1 System Overview

1.1 ECODRIVE - the Economical Control Drive for Automation

ECODRIVE is a digital intelligent automation system which provides a cost effective way to control single and multiple axis tasks.

ECODRIVE can be used to accomplish all kinds of control tasks in different fields. It is typically used in such applications as:

- Handling systems
- Packaging machinery
- Assembly systems
- Printing machines

1.2 Ecodrive - a Family of Control Drives

An **ECODRIVE** consists of a drive controller and a MKD servo motor. There are presently four drive controllers available, each with different control interfaces.

- DKC01.1 with analog, stepper motor, and positioning interfaces
- DKC11.1 with analog interface
- DKC02.1 with SERCOS interface
- DKC03.1 with PROFIBUS-DP interface

The instructions for the DKC01.1 and the DKC11.1 are described in the following section. The DKC02.1 and DKC03.1 have their own documentation.

1.3 Overview of DKC01.1/DKC11.1 Functions

DKC01.1 - Modes of Operation

Servo Drive with Integrated Positioning Control

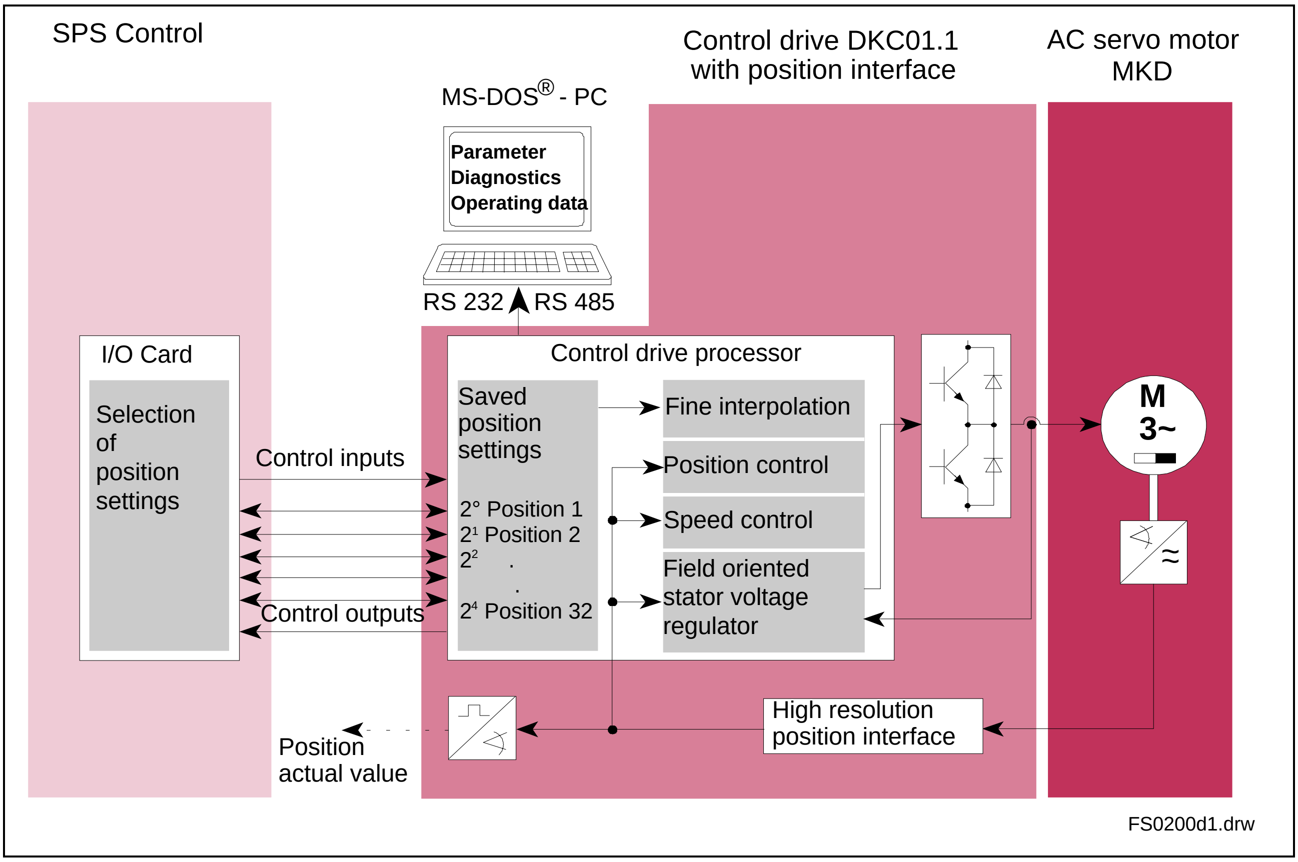


Fig. 1-1: Servo drive with integrated positioning control

- Up to 32 position settings can be stored in the DKC01.1 and DKC11.1. These settings can be selected via parallel inputs. If block selection is conducted via a serial interface (RS232/RS485), then it is possible to use up to 64 positioning blocks. The DKC01.1 executes position settings independently.
- The drive controller can conform to mechanical transmission elements such as gear ratios or feed constants.
- All position, speed, and acceleration data can be weighted rotary or linear depending on axial kinetics.
- An internal homing procedure can help create a reference position.
- The axis can be controlled via the jog function for set-up operations.
- The positioning speed can be influenced with the Feedrate Override.
- Limit switch inputs and parametrical position limits are available to set travel range limits.
- The drive controller status can be determined via status outputs.

Servo Drive with Analog Velocity Interface and Integrated Actual Position Value Register

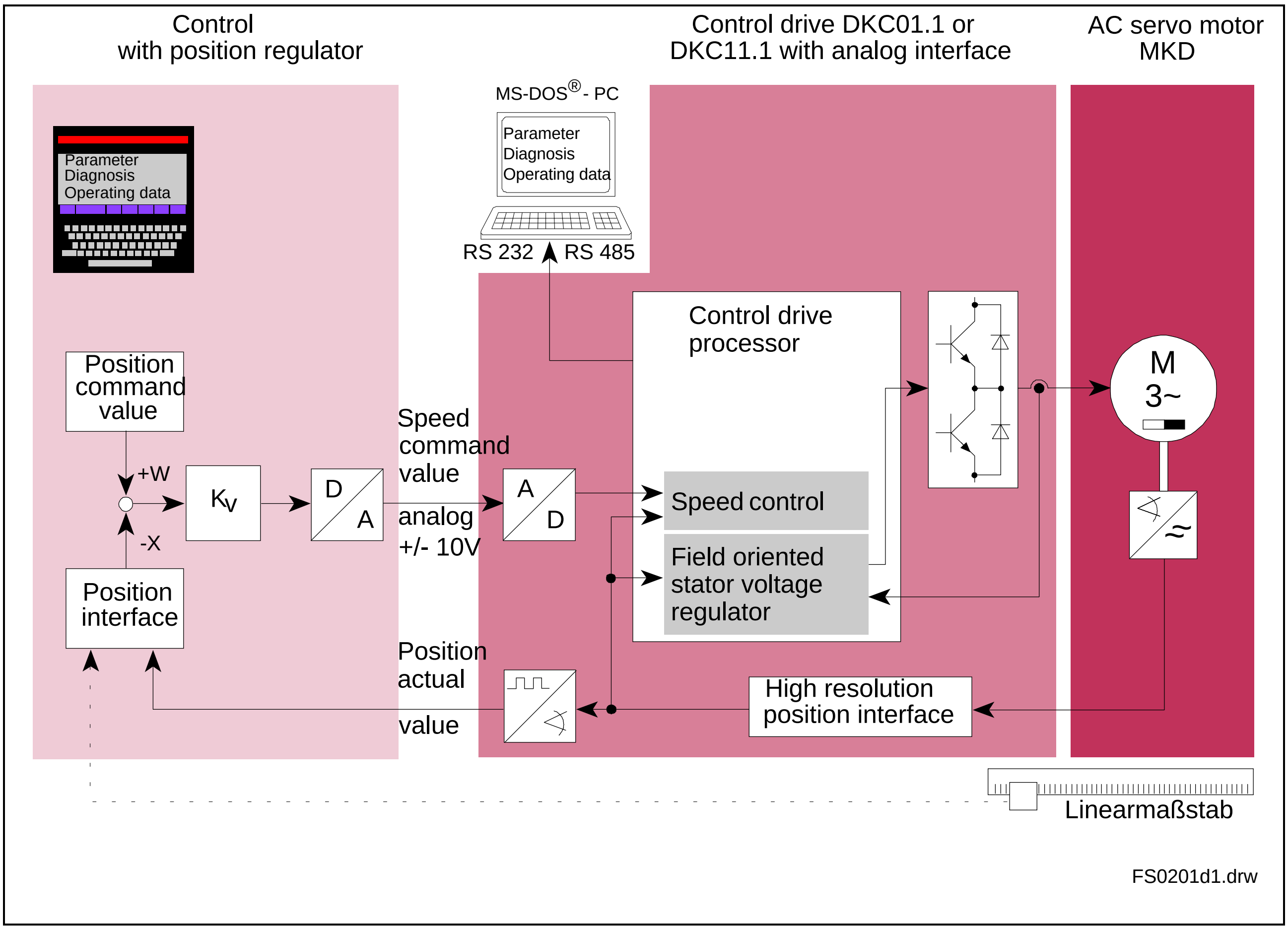


Fig. 1-2: Servo drive with analog velocity interface and integrated actual position value register

- The scaling factor of the analog velocity command value can be set in the DKC.
- The output of the actual position value can be either incremental or absolute.
- Regardless of the command value, the drive controller can be brought to a standstill via a logic input and kept drift free under active control.

Servo Drive with Stepping Motor Interface

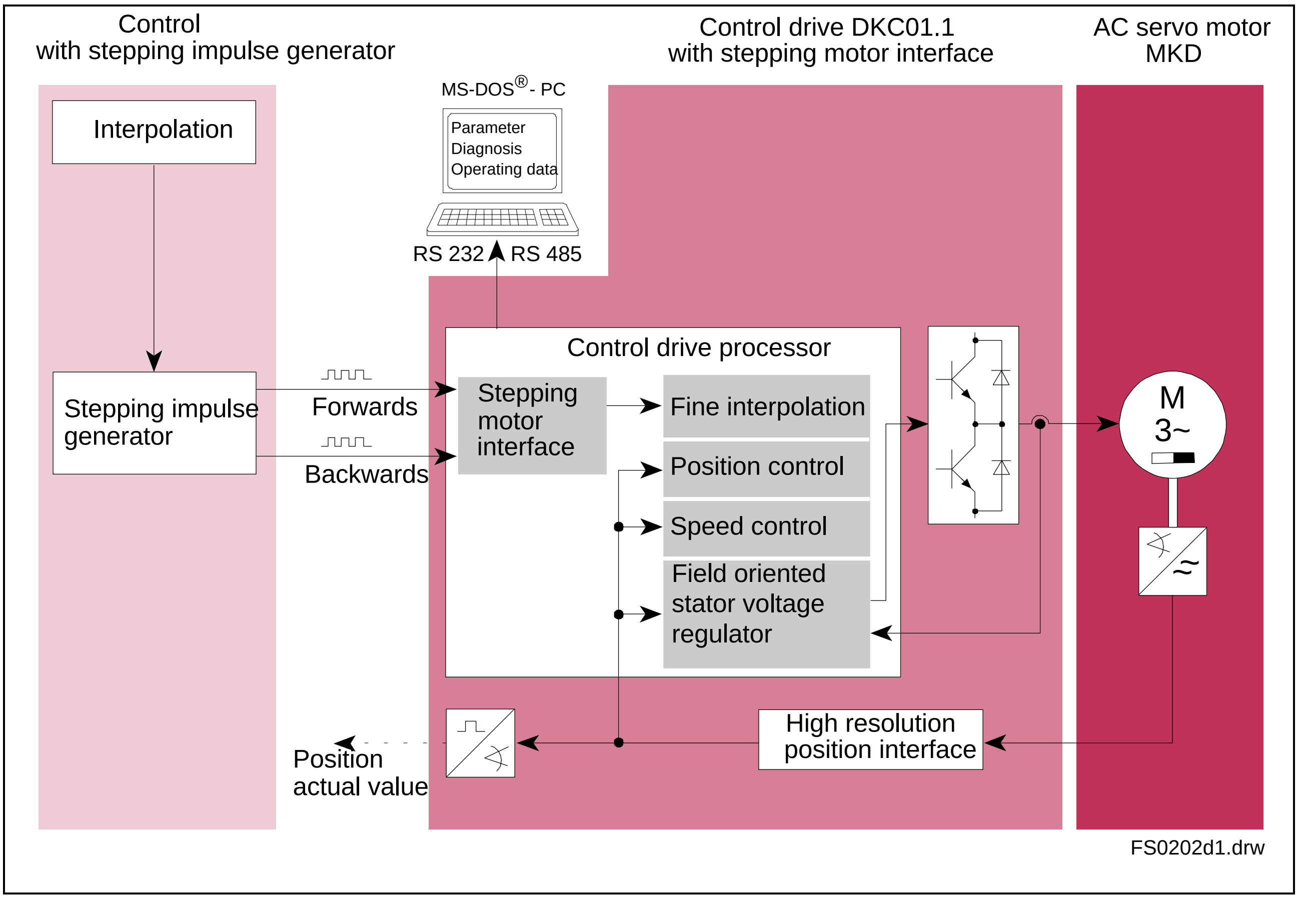


Fig. 1-3: Servo drive with stepping motor interface

- The number of steps per rotor revolution is adjustable between 16 and 65536.
- The maximum stepping frequency is independent of the load. As the position of operation is monitored, it is technically impossible for steps to be "left out".
- The stepper motor interface can be set to three standard signal definitions for trading signals between control and drive controller systems.
  - Quadrature signals
  - Forward/backward signals
  - Step and direction signals
- An internal homing procedure can help create a reference position.
- The axis can be controlled via the jog function for set-up operations.
- The homing and jogging speeds can be influenced via the Feedrate Override.
- Limit switch inputs and parametrical position limits are available to set travel range limits.
- The drive controller status can be determined via status outputs.

Servo Drives with Electric Gear Function

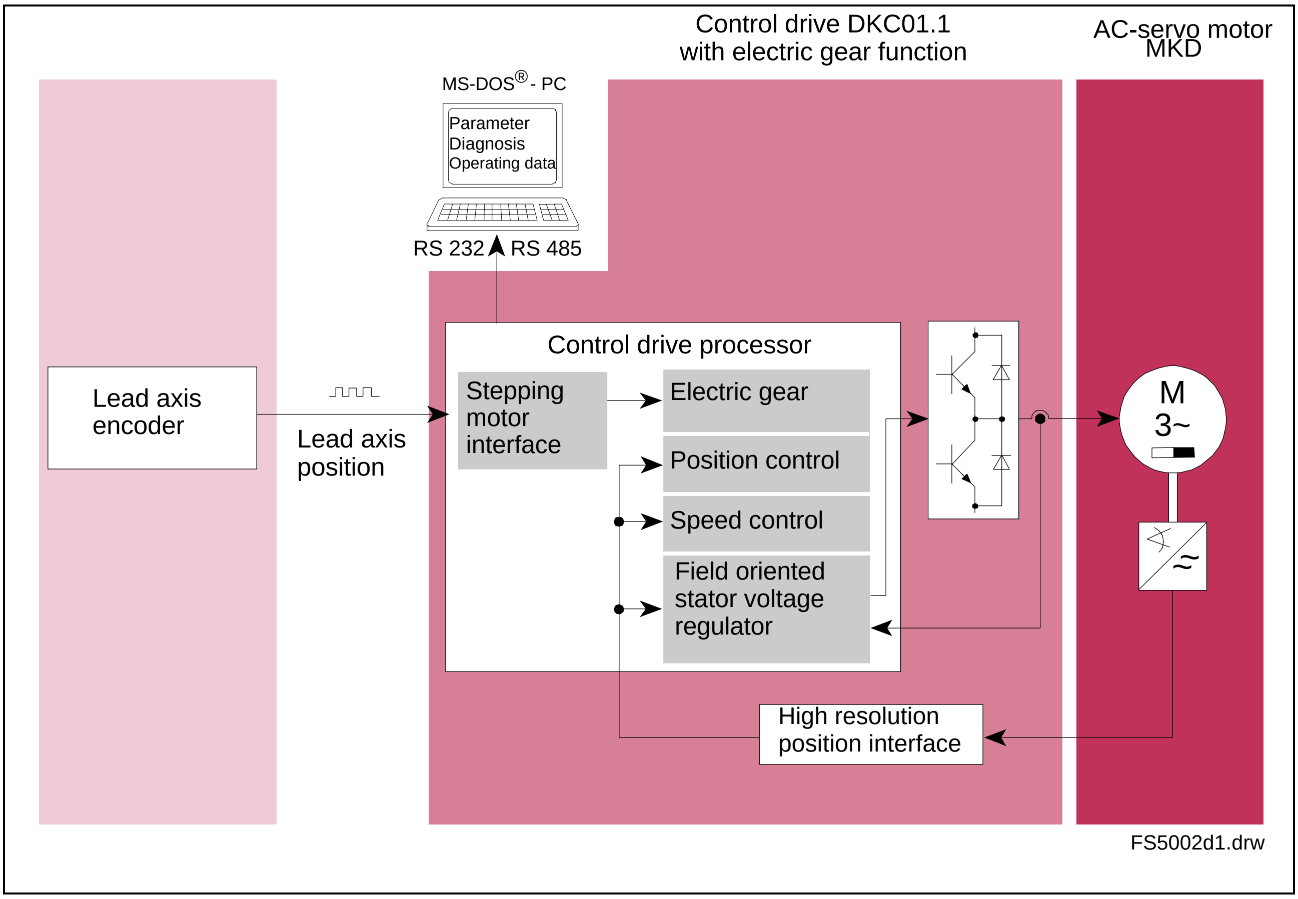


Fig. 1-4: Servo Drives with Electric Gear Function

- Operating modes:

  Speed synchronization

  Angle/phase synchronization

- The master axis position is given in degrees (360 degrees equal to one master axis encoder rotation).
- The master axis encoder must be connected to the step motor interface of the DKC.
- The maximum permissible signal frequency f_{max} of the step motor interface hereby represents a restriction of the number of lines Z_l which can be emulated.

DKC01.1/DKC11.1 General Characteristics

Direct Power Supply Connection

The drive controller can be connected directly to single and three phase 230V power supplies or three phase power supplies ranging from 380V to 480V without transformers. A power rectifier, DC bus capacitor, and bleeder are included as standard equipment.

Integrated Brake Activation

The optional brake in MKD motors is activated directly via the drive controller.

Actual Position Value Measurement

ECODRIVE measures the actual position value via the motor feedback system

- **Incremental position measurement (standard)**
  The actual position value will be set at a random value when the power supply is first turned on. To give the actual position value a fixed reference point, the reference point must be set with a defined homing procedure.
- **Absolute position measurement (optional)**
  After the power supply has been turned on, the absolute actual position value in relation to a fixed reference point is immediately available. Thus, completing the homing procedure is unnecessary.

Actual Position Value Output

The DKC01.1 has an actual position value output for transmission of the actual position value to an NC control. Actual position values can be transmitted in either incremental or absolute format.

- **Incremental Actual Position Value Output**
  5V-TTL incremental encoder signals with an adjustable counter are given as an output. Incremental actual position value output is possible with both actual position value and absolute actual position value acquisition.
- **Absolute Actual Position Value Output**
  The absolute actual position value is transmitted in the standard SSI-format for position encoders. The output of the absolute actual position value is only possible when using a motor with an absolute encoder (optional).

Integrated Diagnostic Display

All internal condition and error analysis is displayed via a dual position seven segment display.

Easy Installation

The installation and diagnostic program DRIVETOP helps with a user-friendly installation via the serial RS-232 interface on a PC running Windows ™ 3.1.

Functional Differences between DKC01.1 and DKC11.1

The DKC11.1 is a DKC01.1 with reduced operating features. The essential differences are shown in the following tables.

Type of Operation	DKC01.1	DKC11.1
Position control with position interface	X	
Position control with stepping motor interface	X	
Speed synchronization	X	
Angle synchronization	X	
Velocity control with analog interface	X	X
Torque control with analog interface	X	X

Fig. 1-5: Overview:Types of operation available with DKC01.1 / DKC11.1

Function	DKC01.1	DKC11.1
Transversing range limits via limit switch	X	
Position regulator loop monitoring	X	
Status messages (INPOS, INBWG, INREF)	X	
Positional forward break-over point function	X	
Control drive guided homing	X	
Jogging	X	
Override function for jogging, positioning, and homing	X	
Actual position output (Incremental or absolute)	X	X
Built-in error reaction	X	X
Velocity regulator loop monitoring	X	X
Analog diagnostic outputs	X	X
Built-in control of the motor brake	X	X
Drift-free standstill of the drive via the stop-drive-function	X	X
Automatic control loop settings	X	X

Fig. 1-6: Overview:Functions available with the DKC01.1 / DKC11.1

Notes

2 Safety Instructions for Electrical Drives

2.1 General

These instructions must be read and understood before the equipment is used to minimize the risk of personal injury and /or property damage. Follow these safety instructions at all times.

Do not attempt to install, use or service this equipment without first reading all documentation provided with the product. Please read and understand these safety instructions, and all user documentation for the equipment, prior to working with the equipment at any time. You must contact your local Indramat representative if you cannot locate the user documentation for your equipment. A listing of Indramat offices is supplied in the back of this manual. Request that your representative send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the product is resold, rented and/or otherwise transferred or passed on to others, these safety instructions must accompany it.

WARNING

Improper use of this equipment, failure to follow the attached safety instructions, or tampering with the product, including disabling of safety device, may result in personal injury, severe electrical shock, death, or property damage!

INDRAMAT GmbH is not liable for damages resulting from failure to observe the warnings given in these instructions.

- Operating, maintenance and safety instruction in the appropriate language must be ordered and received before initial start-up, if the instructions in the language provided are not understood perfectly.
- Proper and correct transport,storage, assembly, and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Trained and qualified personnel in electrical equipment:

  Only trained and qualified personnel may work on this equipment or in its vicinity. Personnel are qualified if they have sufficient knowledge of the assembly, installation, and operation of the product as well as of all warnings and precautionary measures noted in these instructions.

  Furthermore, they should be trained, instructed, and qualified to switch electrical circuits and equipment on and off, to ground them, and to mark them according to the requirements of safe work practices and common sense. They must have adequate safety equipment and be trained in first aid.
- Use only spare parts approved by the manufacturer.
- All safety regulations and requirements for the specific application must be followed as practiced in the country of use
- The equipment is designed for installation on commercial machinery.
- Start-up is only permitted once it is sure that the machine in which the products are installed complies with the requirements of national safety regulations and safety specifications of the application.

  European countries: see Directive 89/392/EEC (Machine Guideline);

- Operation is only permitted if the national EMC regulations for the application are met.

  The instructions for installation in accordance with EMC requirements can be found in the INDRAMAT document „EMC in Drive and Control Systems“.

  The machine builder is responsible for the adherence of the limiting values as prescribed in the national regulations and specific regulations for the application concerning EMC.

  European countries: see Directive 89/336/EEC (EMC Guideline);

  U.S.A.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

- Technical data, connections, and operational conditions are specified in the product documentation and must be followed.

2.2 Protection against contact with electrical parts

Note: This section pertains to equipment and drive components with voltages over 50 Volts.

Touching live parts with potentials of 50 Volts and higher applied to them can be dangerous and cause severe electrical shock. In order for electrical equipment to be operated, certain parts must have dangerous voltages applied to them.

DANGER

High Voltage!

Danger to life, severe electrical shock and risk of injury!

⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and/or repair this equipment.

⇒ Follow general construction and safety regulations when working on electrical installations.

⇒ Before switching on power, the ground wire must be permanently connected to all electrical units according to the connection diagram.

⇒ At no time may electrical equipment be operated if the ground wire is not permanently connected, even for brief measurements or tests.

⇒ Before beginning any work, disconnect mains or the voltage source from the equipment. Lock the equipment against being switched on while work is being performed.

⇒ Wait 5 minutes after switching off power to allow capacitors to discharge before beginning work. Measure the voltage on the capacitors before beginning work to make sure that the equipment is safe to touch.

⇒ Never touch the electrical connection points of a component while power is turned on.

⇒ Before switching the equipment on covers and guards provided with the equipment must be installed to prevent contact with live parts. Before operating cover and guard live parts properly so they cannot be touched.

⇒ A leakage current protective device must not be used for an AC drive! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

European countries: according to EN 50178/ 1994;

⇒ Electrical components with exposed live parts must be installed in a control cabinet to prevent direct contact.

European countries: according to EN 50178/ 1994;

⇒ U.S.A: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

DANGER

High discharge current!

Danger to life, risk of severe electrical shock and risk of injury!

⇒ All units and the motors must be connected to a grounding point with the ground wire or must be grounded themselves before switching on power.

⇒ The discharge current is greater than 3.5 mA. A permanent connection to the supply system is therefore required for all units.

European countries: according to EN 50178/1994, section 5.3.2.3;

⇒ U.S.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

⇒ The ground wire must always be connected before start-up, even during the performance of tests. Otherwise, high voltages may be present at the unit housing, which can result in severe electrical shock and personal injury.

2.3 Protection by protective low voltage (PELV) against electrical shock

All connections and terminals with voltages ranging between 5 and 50 volts on INDRAMAT products are protective low voltages designed in accordance with the following standards on contact safety:

- International: IEC 364-4-411.1.5
- European countries within the EU: see EN 50178/1994, section 5.2.8.1.

WARNING

High electrical voltages due to incorrect connections!

Danger to life and limb, severe electrical shock and/or serious bodily injury!

⇒ Only that equipment or those electrical components and cables may be connected to all terminals and clamps with 0 to 50 volts if these are of the protective low voltage type (PELV = Protective Extra Low Voltage).

⇒ Only connect those voltages and electrical circuits that are safely isolated. Safe isolation is achieved, for example, with an isolating transformer, an optoelectronic coupler or when battery-operated.

2.4 Protection against dangerous movements

Dangerous movements can be caused when units have bad interfaces or motors are connected incorrectly.

There are various causes of dangerous movements:

- Improper or incorrect wiring or cable connections
- equipment is operated incorrectly
- probe parameters or encoder parameters are set incorrectly
- broken components
- errors in software or firmware

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

Although the monitoring circuits in the drive components make improper operation almost impossible, personnel safety requires that proper safety precautions be taken to minimize the risk of electrical shock, personal injury and/or property damage. This means that unexpected motion must be anticipated since safety monitoring built into the equipment might be defeated by incorrect wiring or other faults.

DANGER

Dangerous movements!

Danger to life, electrical shock and risk of injury or equipment damage!

⇒ In the drive component monitoring units, every effort is made to avoid the possibility of faulty operation in connected drives. Unintended machine motion or other malfunction is possible if monitoring units are disabled, by-passed or not activated.

⇒ Safe requirements of each individual drive application must be considered on a case-by-case basis by users and machine builders.

Avoiding accidents, electrical shock, personal injury and/or property damage:

⇒ Keep free and clear of the machine’s range of motion and moving parts. Prevent people from accidentally entering the machine’s range of movement:

- use protective fences
- use protective railings
- install protective coverings
- install light curtains

⇒ Fences should be strong enough to withstand maximum possible momentum.

⇒ Mount the Emergency Stop (E-Stop) switch in the immediate reach of the operator. Verify that the Emergency Stop works before start-up. Do not use if not working.

⇒ Isolate the drive power connection by means of an Emergency Stop circuit or use a safe lock-out system to prevent unintentional start-up.

⇒ Make sure that the drives are brought to standstill before accessing or entering the danger zone.

⇒ Disconnect electrical power to the equipment using a master lock-out and secure against reconnection for:

- maintenance and repair work
- cleaning of equipment
- long periods of discontinued equipment use

⇒ Avoid operating high-frequency, remote control, and radio equipment near equipment electronics and supply leads. If use of such equipment cannot be avoided, verify the system and the plant for possible malfunctions at all possible positions of normal use before the first start-up. If necessary, perform a special Electromagnetic Compatibility (EMC) test on the plant.

2.5 Protection against magnetic and electromagnetic fields during operations and mounting

Magnetic and electromagnetic fields in the vicinity of current-carrying conductors and permanent motor magnets represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

⇒ Persons with pacemakers and metal implants are not permitted to have access to the following areas:
  - Areas in which electrical equipment and parts are mounted, operating or are being commissioned.
  - Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.

⇒ If it is necessary for a person wearing a heart pacemaker to enter into such an area then a physician must be consulted prior to doing so.

⇒ Persons with metal implants or hearing aids must take care prior to entering into areas described above. It is assumed that metal implants or hearing aids will be affected by such areas and a physician must be consulted prior to doing so.

2.6 Protection during handling and installation

All INDRAMAT products should be handled and assembled according to the instructions in the documentation.

CAUTION

Risk of injury due to incorrect handling!

Bodily injury caused by crushing, shearing, cutting, and thrusting movements!

⇒ Observe installation instructions and safety regulations before handling and working on the product.

⇒ Use suitable installation in using lifting or moving equipment. Refer to the user manual for the product.

⇒ Take precautions to avoid pinching and crushing.

⇒ Only use suitable tools specified in the user manuals and use them according the instructions.

⇒ Use lifting devices and tools correctly and safely.

⇒ Wear appropriate protective clothing, e.g., protective goggles, safety shoes, protective gloves.

⇒ Never stand under suspended loads.

⇒ Clean up liquids form the floor to prevent personnel from slipping.

2.7 Battery safety

Batteries contain reactive chemicals. Incorrect handling can result in injury or equipment damage.

CAUTION

Risk of injury due to incorrect handling!

⇒ Do not attempt to reactivate dead batteries by heating or other methods (danger of explosion and corrosion).

⇒ Never charge batteries (danger from leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not take batteries apart.

⇒ Handle carefully. Incorrect extraction or installation of a battery can damage equipment.

Note: Environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air, and sea transport in the sense of the legal requirements (Danger of explosion). Dispose of batteries separately from other refuse. Observe the legal requirements in the country of installation.

3 Preparing for Startup

3.1 General Instructions for Startup Procedure

In this chapter the initial operation and diagnostic system DriveTop will be introduced. In general, it is necessary to install DriveTop on the PC if the startup procedure of the DKC is to work. Drive Top follows this handbook to concurrently run offline. In the following chapters the document will frequently refer to this program.

Note: If you would like to see a short summary of ECODRIVE's qualities, go to section 9.

3.2 Drive Top Startup Procedure and Diagnostics

DriveTop is a WINDOWS based application program used in the initial operation and diagnosis of **ECODRIVE** drive controllers.

DriveTop has a user friendly start up guide. The initial operator will be led through a series of functional dialogues for the input of all operational settings. For each of these dialogues there are help instructions that can be activated with the press of a key.

The startup parameterization process is set up so that the user is only confronted with parameter settings that are relevant to the chosen operating configuration only.

3.3 DriveTop-System Requirements

DriveTop is a Windows based application program. Minimum PC requirements are:

- IBM compatible 80386 / 40MHz (80486 recommended)
- 4MB RAM (8MB recommended)
- 5MB free hard drive space for Drive Top and an additional 15 MB for the ECODRIVE help system
- A free serial port
- VGA graphics
- Mouse or compatable pointing instrument
- Windows 3.1 / 3.11 / Windows 95

3.4 Installation of DriveTop

DriveTop will be on two (2) 3.5" disks (Dos format;1,44MB)

Note: Please make a backup copy of the Drive Top installation diskettes. Install the software from these copies. Store the original diskettes in a safe place! For installation on your computer, use the installation programs on the diskettes. It will not work if you simply copy the diskettes.

Starting the Installation Program

When installing DriveTop, procede as follows:

Installation in Windows 3.1 / 3.11

- Turn on the PC and start Windows
- Place "Diskette 1" in the disk drive
- Activate the Windows Program Manager
- At the menu, click on "FILE" and choose from the drop down menu "LOAD".
- At the command prompt type "A:\SETUP" (if the DriveTop diskette is in drive A:)
- The order of the installation program is as follows:

After a successful completion of the installation you will find the new program group icon **INDRAMAT** on your PC. Within this group you will find the DriveTop icon.

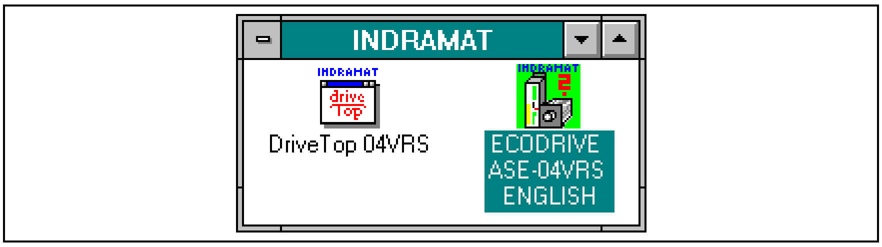


Fig. 3-1: INDRAMAT program group with the DriveTop and ECODRIVE Help icons

Installation in Windows 95

- switch PC on and startup Windows 95
- DriveTop disk 1 must be inserted into disk drive
- select command „EXECUTE..." in menu
- in input field „Open:" input A:\SETUP. (if DriveTop disk is in drive A:.)
- Now, follow the instructions of the installation program.

With a successful installation, the DriveTop program symbol can be reached via Start / Program / Indramat.

Setting communications parameters

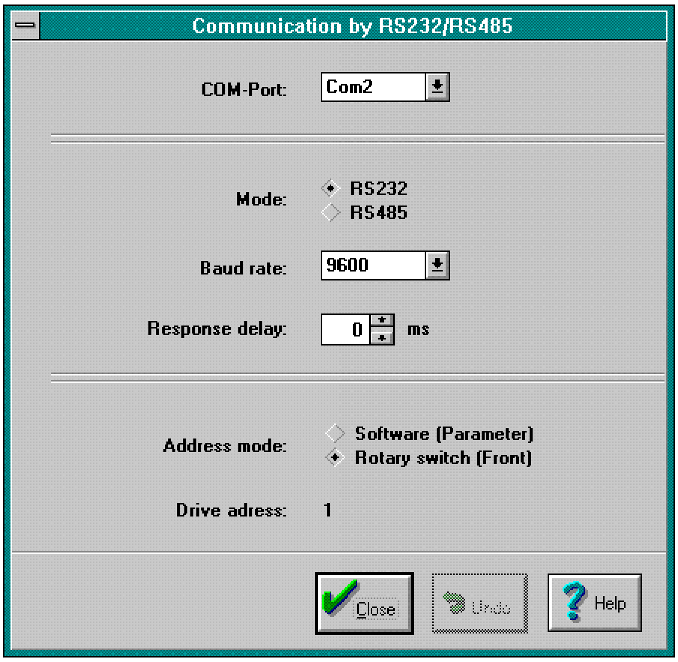


Fig. 3-2: Communications dialog

COM-Port

Most PCs are equipped with several serial interfaces (COM ports).

Via the COM port setting it is possible to select the interface which is to be used for communications with the drive controller. COM1 and COM2 can be standardly set. (If COM3 or COM4 are to be used, then the pertinent data must be entered in STOP.INI-File so that the interrupt and the I/O addresses can be used. These two interfaces are then also available.

Mode

DriveTop can be connected to a drive controller via RS232 or it can communicate with a drive group made up of 32 drives via an external RS232/RS485 interface converter.

The desired mode must be set.

Baudrate

The DKC drive controller can communicate at different baud rates:

- 9600 baud
- 19200 baud

Additional interface parameters

- 8 data bits
- no parity
- one stop bit

Response delay

The response delay defines the minimum length of time that must pass after the last telegram symbol has been received via the serial interface and before the first symbol of the reaction may be sent by the drive. This length of time is required when operating the RS485 when changing from transmit to receive mode or vice versa. This parameter is not needed when operating the RS232. It should, nonetheless, be set at 1ms.

Depending on the PC used, it may be necessary to set the response delay to 20 to 30 ms because of the higher priority interrupts in the PC interrupt serial communications.

Addressing method

If several axes are to be connected to a shared master (PC or PLC) via the RS485 interface, then each bus participant must have its own individual address.

When setting the *address via software*, the address is fixed by inputting an address number into input field *drive address*.

3.5 Connecting the PCs with the Drive Controller

A serial communication cable is used for data transfer between the PC and the drive controller. This cable can be purchased from **INDRAMAT** and can be either a 9 pin or 25 pin D-SUB connector. The pin diagram of the cable is shown in the following Fig..

See also section 11.3 **Communication over the RS485 Interface**

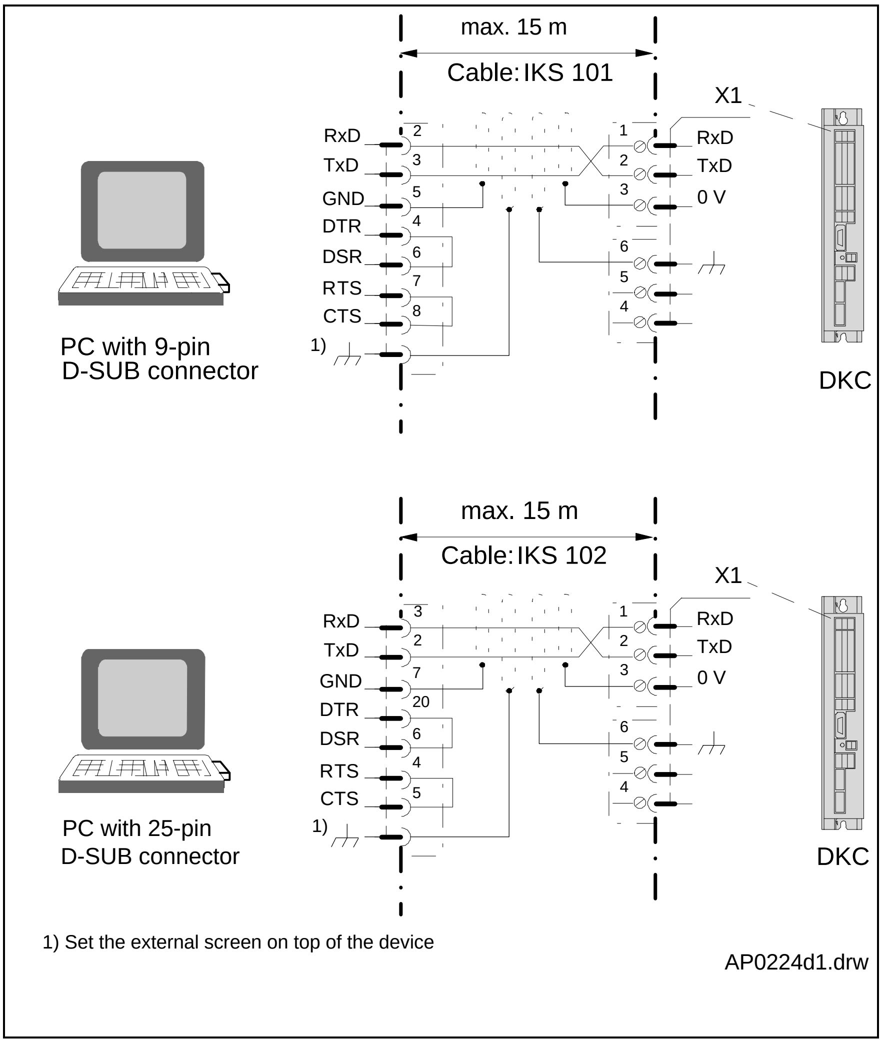


Fig. 3-3: Connecting a PC via the RS232-interface on the DKC

Note: Please pay close attention when connecting the relative potential (OV/GND) to the internal cable shields!

3.6 Minimal Installation for Operation of a DKC with DriveTop

The command for the first DKC parameter setup is shown in the following minimal installation.

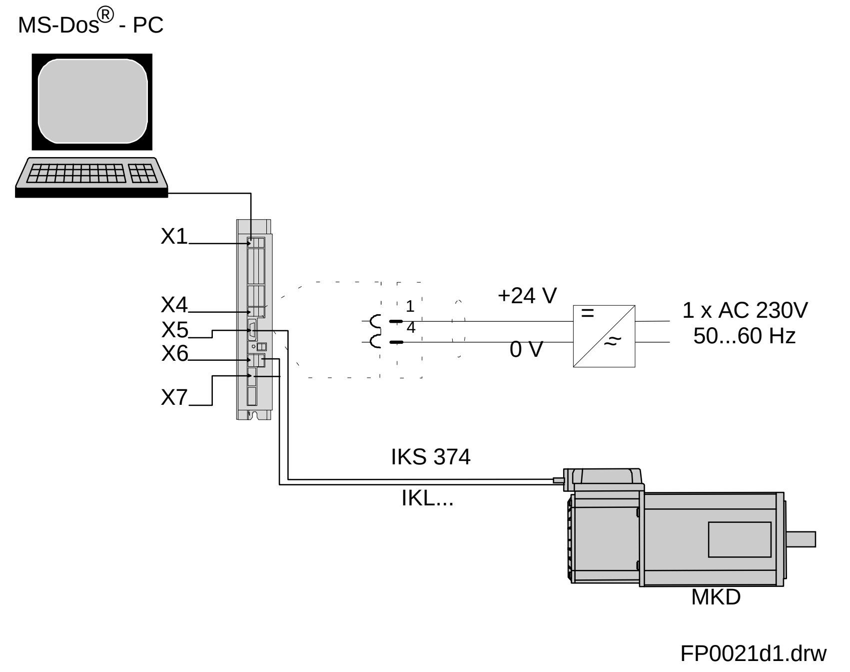


Fig. 3-4: Minimal installation for simple parameter setups

With this installation the parameter setup can be easily accomplished. To activate the drive and to carry out motions more installations are required.

Note: Detailed installation instructions are found in the Project Planning Manual.

3.7 DriveTop Start Up

DriveTop can be started by double clicking the DriveTop icon. It then asks as to how it should search the interfaces for drives.

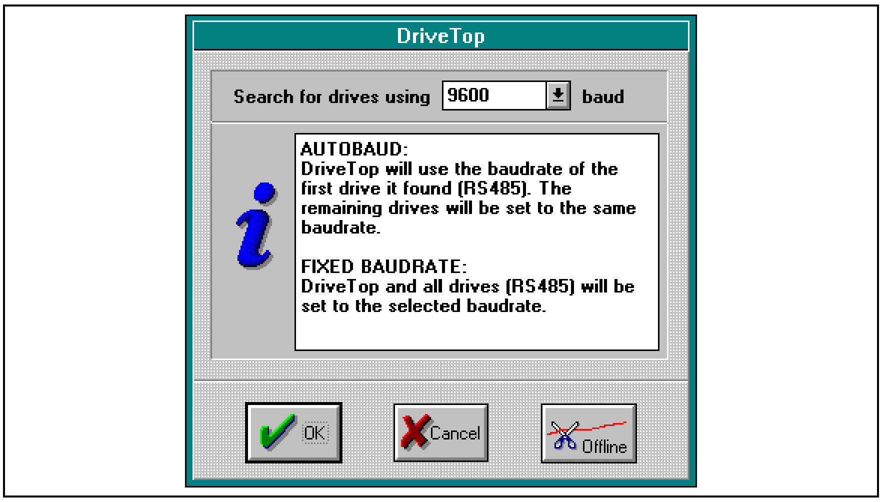


Fig. 3-5: Inputting the baudrate for searching for drives

If a **permanent baud rate** is entered, then all drives at the serial interface will be set to this baud rate, followed by a search for existing addresses.

AUTOBAUD = **automatic baud rate search** means that there is a search for the first existing address (drive) at any available rate. All other drives are set to the baud rate of the first drive located. If the **RS-485** bus system is used, then identical addresses should not be allowed to occur as this could otherwise lead to bus collisions.

Note: An automatic baud rate search takes more time.

Offline operations permits the preparation of parameter blocks without a connected drive controller.

Scanning for Connected Drives

After DriveTop starts up, it searches for connected drives. It thereby tests every drive address between 1 and 99.

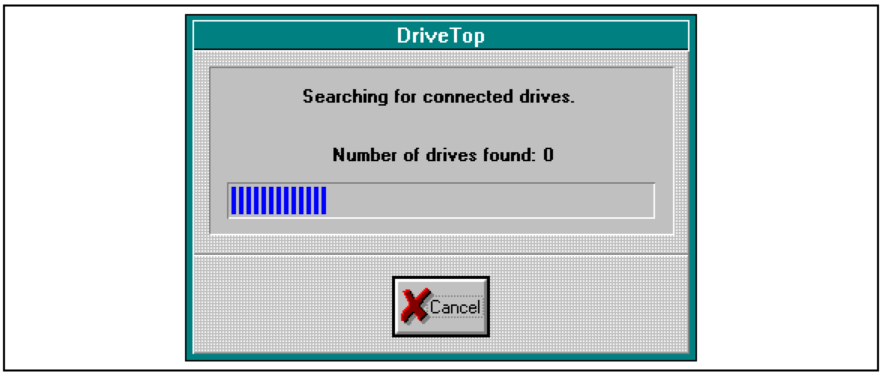


Fig. 3-6: Scanning drive addresses

If one or more drive controllers are found, then the parameter settings of the drive will be classified.

Note: Multiple drives may be found when the PC is connected by an RS232/RS485-interface converter to more drives which are interfaced with an RS485. All drives must be set to the same baud rate.

If no drive is found then the following dialogue appears:

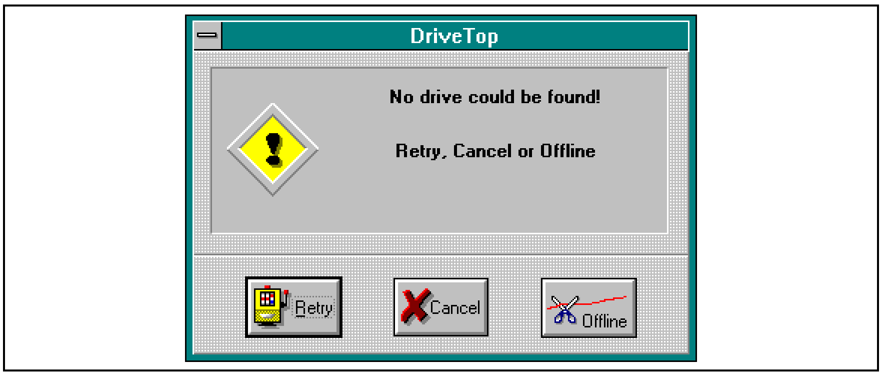


Fig. 3-7: Dialogue appearing after failed scan

Reasons for this error can be:

- The +24Vdc control voltage for the DKC is not turned on or not connected.
- Problem in the connection between PC and the drive controller.

Establishing a connection can be retried, the program can be cancelled or you can go to offline mode.

Online and Offline Operation

Parameter Setup through Online Operation Startup Procedure

Online operation is a drive controller in direct communication with the PC via the serial communication link. That means that in online operation, all the parameters that are in the current dialog screen of the start up sequence are written directly to the drive controller and immediately become effective. The user can also immediately test the results of his installation.

Parameter Setup through Offline Operation Startup Procedure

Offline operation means there is no connection to the drive controller from the PC. Offline operation allows the operator a conventient preparation of the parameter settings which can then, in their entirety, be sent via a connection to the desired drive controller. There remains but a little bit of work for the operator which cannot be completed offline due to the dependency of the machine.

Diagnostic Window

After a successful drive controller parameter scan, the following diagnostic window will appear on the PC screen.

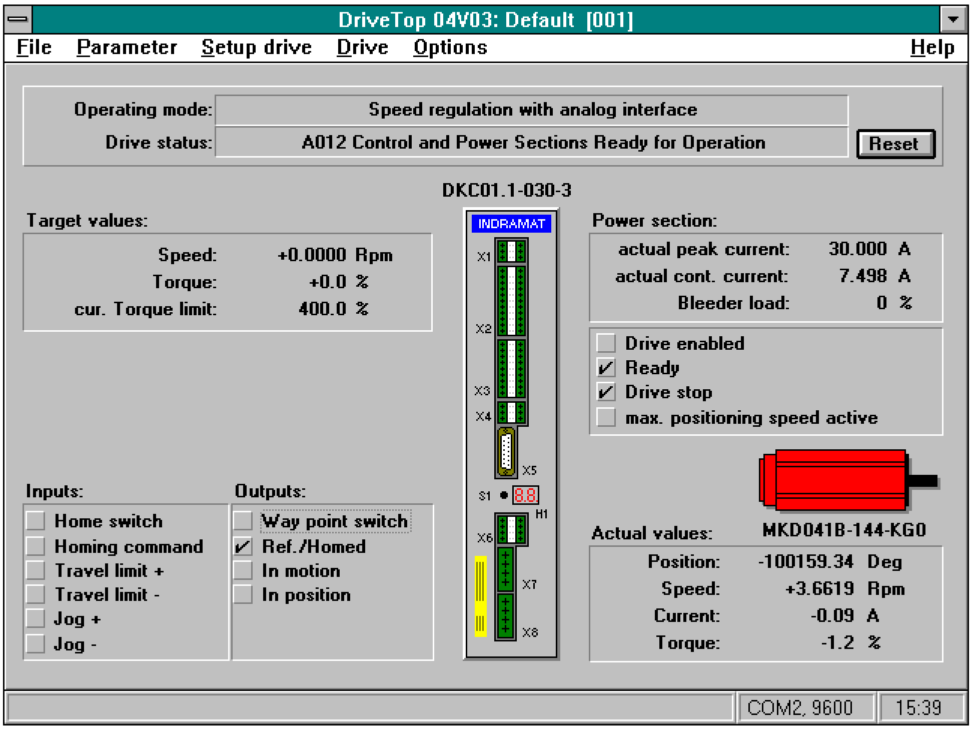


Fig. 3-8: Diagnostic Window

The diagnostic window displays the following:

- Drive controller status and error messages
- Command value and actual value
- Power on status and status signals
- Model descriptions of installed components

Note: The diagnostic window appears only online. In offline operation, graphics with the ECODRIVE components are shown instead of the diagnostic window.

Password protection

General information on password protection

With the help of a user-defined password, accessing drive parameters can be prevented. It is now not possible to make any parameter changes until the user unlocks the drive by inputting the password. The password protection itself is integrated into the drive.

The functions for password protection can be called up via the menu **Options/password protection.**

The password '007' is preset in the drive. It unlocks the drive, i.e., password protection is not active.

A user password can entail the letters A through Z / a - z (lower and upper case letters must be differentiated!) and the numbers 0-9. There must be a minimum of three symbols with a maximum of ten.

See also parameter **S-0-0267, Password**

Change password

This dialog can be used to change the existing password, or to write '007' back into the drive. The dialog can be called up with the menu **Options/Password protection/Change password.**

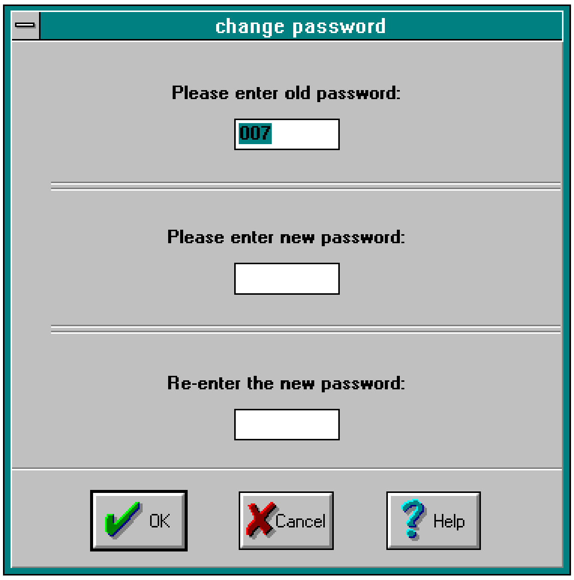


Fig. 3-9: Dialog to change the password

Procedure: To enter a new password, all three editing fields must be filled out. The current password must be entered into the first field (either '007' or an already existent user password). The new password is entered into the other two fields. A mouse or the tab key can be used for moving from one field to the next. If the dialog is closed with the 'OK' key, and the other entered passwords are correct, then the new password is active and the drive locked.

Cancel password protection

If a user password is to be cancelled and the drive permanently unlocked, then '007' must be entered as the new password.

Unlock drive

If a parameter is to be changed (with password protection active), or if select menu item **Options/Password protection/Unlock drive is selected, then this dialog appears**.

Fig. 3-10: Unlock drive

Procedure: Enter the current user password and complete the dialog using the 'OK' key. The drive is unlocked.

Lock drive

If the drive is to be locked, then using menu item **Options/Password protection/lock drive must be called up in the following dialog.**

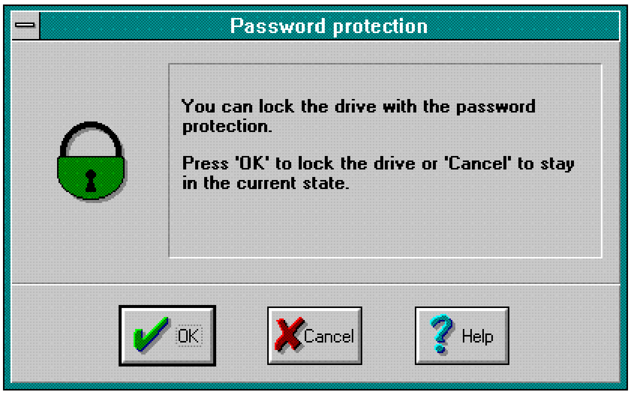


Fig. 3-11: Locking the drive

Procedure: Press the 'OK' key and the drive is locked.

Locking with RS - 485

Once a user password is entered, the drive is locked when starting and leaving DriveTop. If DriveTop is used to start a new drive (RS - 485), then both the old and the new drives are locked.

Integrating help sytems

DriveTop displays, in list "Documentation installed“ every help system installed for Indramat drive controllers. There is also the option of adding any Windows help system in this library.

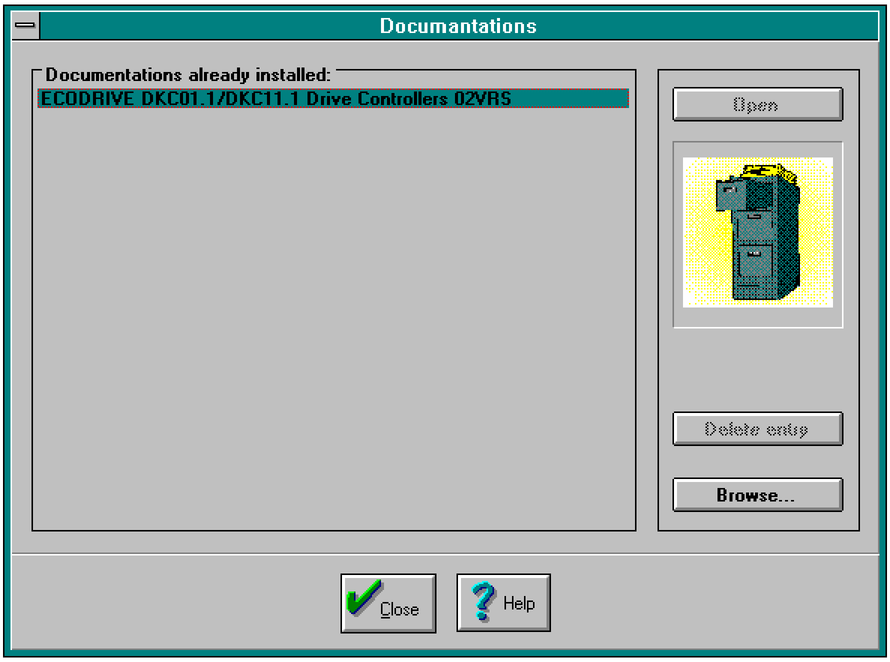


Fig. 3-12: Documentation

Searching for and integrating help systems

Use the "Search" key to get into the "Insert" dialog. Select the desired file type (Indramat help or general help) and change to the directory in which the help system is located. The available titles will appear in the selection lists. By double clicking a title, it is copied into the library.

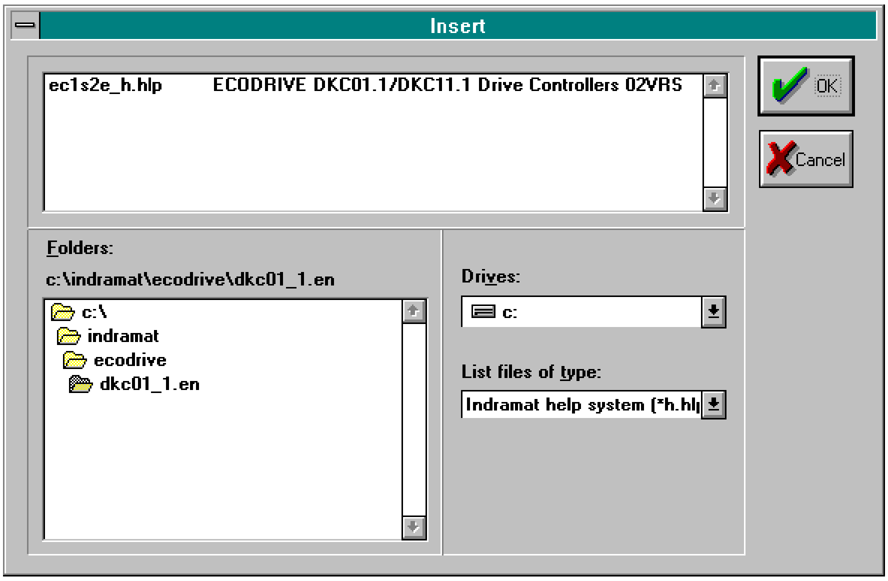


Fig. 3-13: Inserting a help system

Deleting help systems from the documentation libary

Entries no longer wanted n the list of installed documentation can be removed. Select the entry. Pressing key "Delete entry" will remove the documentation from the list.

Opening a help system

Select an entry from the list of installed documentation. By double clicking or pressing the key "Open", the Windows help system will be started.

3.8 DriveTop Menu Structure

Files

Load File

You can choose from a list of available parameter files. The data within these parameter files can be loaded into the drive controller.

Note: In offline operation the content of the parameter files can be viewed and changed.

Load base parameters

The parameters are set to standards values at the factory. This overwrites the present settings.

Parametrization mode is switched into.

Save File

The actual parameters of a connected drive controller are stored in a parameter file on the PC.

Note: "DKC11.PAR". With the help of this parameter file, you can restore the state of the parameters of the drive controller at any time. For your own parameter data, you should use other file names.

Exit (Alt+F4)

Under the Menu item "End" you can leave the DriveTop program.

Parameter

Mode

The drive controller recognizes parameter mode and drive mode. Under this menu one can switch between the modes. There are a number of parameters that can only be altered in parametrization mode (7-segment display P2). Traversing is only possible in operating mode.

Controller / Motor type / Selecting operating mode

Information about the connected motor type and the drive controller used can be accessed via this menu point. This information is permanently programmed into the motor feedback or drive controller. The user must enter this data directly himself when Offline.

Additionally, the **overload factor** and **PWM frequency** with which the drive is to be operated is entered here.

The desired **operating mode** can also be selected from a **specific list**.

Additional Parameter Displays

Additional parameter windows appear in the parameter menu. They are independent of the selected operation. The mentioned parameter windows are self-explanatory and will not be discussed further.

List of All Parameters

A list of all drive controller parameters can be examined and changed in this menu. Therefore, a “Low-Level" possibility is required for parameter examination. It is used in certain exceptional cases. Normally all the drive parameters relating to start up parametrization were implemented.

List of the Invalid Parameters

By switching from parameter into drive mode, the actual parameters will be checked for validity. All of the incorrect parameters and those that will lead to boundary value problems are placed in an invalid parameter list and can be corrected within the list.

Scanning

As DriveTop is started, all the parameter information is read from the connected drive controller. For reasons of speed, the specific parameter values are only read from the contents of the parameters.

Often it is necessary to move from one drive controller to another without restarting the DriveTop program. In order to refresh the parameter window, it is necessary to perform a new parameter scan after plugging the interface cable into another drive controller.

Startup Procedure

Parameter Settings

The parameters regarding the set up procedure leads the user through a series of dialogue procedures. At the end, all of the necessary installation requirements are set.

Drive

Scan

DriveTop can be physically connected to more that one drive controller at the same time with the use of an RS232/RS485 interface converter. Under the menu “Scanning", DriveTop looks for connected drives.

Select

If DriveTop is connected to more than one drive with the RS485 interface.Drive controller selection of which device is being communicated to is done from this menu.

Offline

DriveTop can be operated online or offline

Options

Language

The language in which DriveTop functions and the language of the parameters and diagnostics of the drive controller can be selected or changed with this menu.

Password protection

It is possible here

- to enter one's own password,
- lock the drive against unwanted parameter changes,
- and unlock the drive for parameter changes.

Communications

In communications, settings can be made that affect data exchange between drive controller and PC.

- select the COM ports
- fixing the baud rate
- setting addresses

Help

Contents

This menu accesses the online documentation. The online documentation contains a large scope of information regarding the functional qualities of the drive system, parameter descriptions, and diagnostic descriptions.

Using Help

There are on-screen general instructions to navigate through the help system.

Documentation

Help systems are integrated into the library.

Information about ...

Information regarding the software version of DriveTop.

3.9 Printing Parameter Data

DriveTop does not offer a direct possibility of printing the parameter files.

Parameter files are stored as ASCII files and can be viewed with almost any editor and printed. If parameter files are to be printed, it is suggested that the Microsoft editor "**Notepad**" be used. Notepad is a part of Windows 3.1 and therefore available within Windows 3.1. To print a parameter file the following instructions are required:

An example of a parameter file "X_Axis.par”:

- Under the Program Manager menu choose "Run - File..."
- At the command prompt type "**Notepad** X_Axis.par" and click the "OK icon."
- Click on menu item “File” then click on “Print”(The printing process will begin.)

4 Motor and Drive Controller Selection

4.1 General Information on Selecting a Motor and Drive Controller

An **ECODRIVE** system consists of a drive controller (DKC) and a servo motor (MKD). Selection documents (selection lists) can help in choosing a drive controller and a motor for a specific application. These documents can be obtained from **INDRAMAT**.

Certain information about the motor and drive controller is used at start up to answer questions about installing parameters. During online operation this information is read from the connected motor and drive controller and does not have to be entered by the user. During offline operation the drive controller and motor are not connected, necessitating the user to enter this information directly.

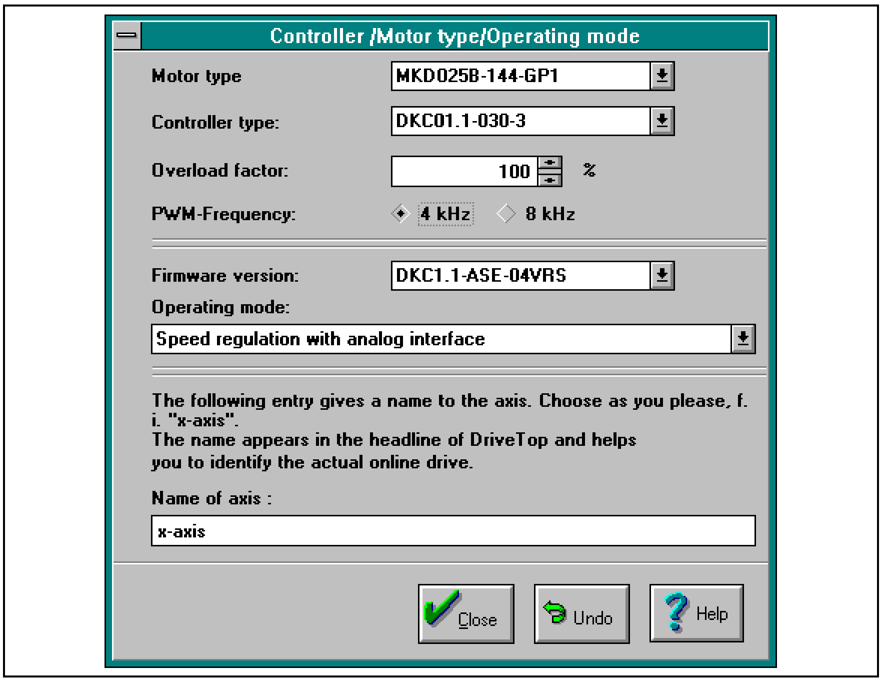


Fig. 4-1: Dialog controller / motor type / select operating mode

4.2 Motor Selection

The connected drive type is displayed in **online mode.** See parameter S-0-0141.

Specific application information about the motor is needed for **offline** operation.

DriveTop needs this motor-specific data to determine specific parameter settings. (Motor current, velocity, standard control parameters, feedback type, etc.)

If a different motor type is entered offline than is later used, the diagnosis "UL" will appear at the time when the parameter block is loaded into the drive. This means that the type of motor in the parameters is not identical with the type of motor that is actually connected. If this happens, do the following:

⇒ Acknowledge the error by pushing the S1-button on the drive controller. If the drive controller does not discover any additional errors, "bb" is displayed.

⇒ Reset the installation parameters and recalculate the parameters of the drive controller limits.

4.3 Drive Controller Selection

In **online mode,** the type of the controller connected is entered here.

For **offline** operation, select the type of drive controller. There are five available:

- DKC01.1-040-3
- DKC01.1-040-7
- DKC03.1-040-7
- DKC03.2-100-7
- DKC11.1-040-7

The type of drive controller selected determines the availability of operational and functional modes. This adjustment happens automatically during online operation by reading the "Controller Type" parameter of the connected drive controller.

See also S-0-0140, controller type

Note: The DKC11.1 limits the available functions only during online operation.

Selecting the Overload Factor

The short term operating torque of the drive controller is defined via the overload factor. The velocities and torques available with the different combinations of drive controller, motors and power supply input voltages are provided in the DKC/MKD selection lists. The overload factor needed to obtain the drive controller data can be read off of the last column in each line of the selection list.

See also P-0-0006, overload factor

Note: The projected selection data is necessary for correct adjustment.

Selecting the PWM-Frequency

The clock frequency of the power output (PWM frequency) of the drive controller can be set to either 4 kHz or 8 kHz. The PWM frequency determines the noise level of the motor, the permanent current carrying capacity of the drive controller, and also the available short term operating torque of the control drive. The following rules apply to the settings:

- The 4 kHz PWM frequency should be used in standard applications to maintain the high short term operating torque of the drive controller.
- The 8 kHz setting should be used in applications where the environment requires a low noise level. It is important to note that when using the 8 kHz PWM frequency, the drive controller has a lower permanent current carrying capacity as well as reduced short term torque. All permanent current and permanent torque data will be reduced by a factor of approximately 0.9.

Notes

5 DKC01.1 Drive Controller with Integrated Positioning Control

5.1 Fundamental Method of Operation for Position Control

The DKC01.1 can store up to 64 different position commands. One of the first 32 positioning blocks can be selected via five circuit inputs. Positioning blocks 32 to 63 can only be selected via the serial interface. A start signal starts the selected positioning block. The following are allowable motion changes to the position commands:

- **P-0-4006, process block target position**
- **P-0-4007, process block velocity**
- **P-0-4008, process block acceleration**
- **P-0-4009, process block jerk**
- **P-0-4019, process block mode**

Note: The positioning speed can be changed with the velocity override function and by positioning with limited speed.

5.2 Setting operation mode: Position control with position interface

"Position Control with Positioning Interface" mode is standardized by the controller / motor type / operational mode window.

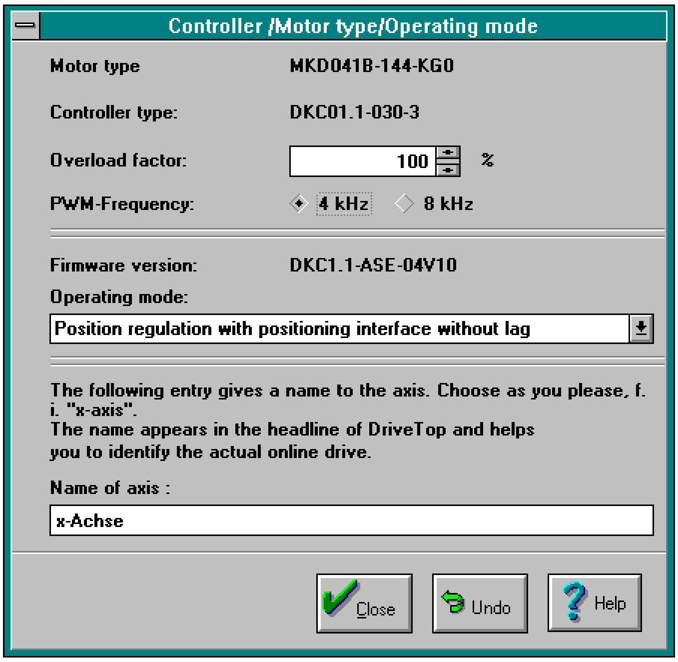


Fig. 5-1: Position control with positioning interface

Position control with following error

When positioning in this mode, a speed-dependent difference between the command position and the actual position results (following error). The time relationship between positioning processes depends on the fixed Kv factor and may cause a "creeping" into the desired position, especially with a small Kv factor.

Position control without following error

An expected speed control will position the drive controller without following error, thereby causing the command position and the actual position to be the same. Therefore, positioning is not dependent on a speed difference between the command and actual position.

When in position control without lag distance, a speed pre-control ensures that command and actual position are the same at constant command speed. No speed-dependent difference between command and actual position results.

Selecting the appropriate position control mode

In general, the position control without following error is advantageous because in this mode the drive reaches its desired position the quickest.(No Kv-factor-dependent creeping)

Given a less rigid mechanical system, undesireable acceleration kink points as well as the mechanical vibrations are loosened. If the application permits disadvantageous following errors, then the use of position control with following error is suggested.

Vibrations will then be dampened through the reduction in the Kv factor. A compromise is thus created between positioning and load rigidity.

5.3 Positioning Operation

Absolute Positioning

Process block mode is set via parameter **P-0-4019, process block mode.**

Example: Absolute positioning with a desired position = 700

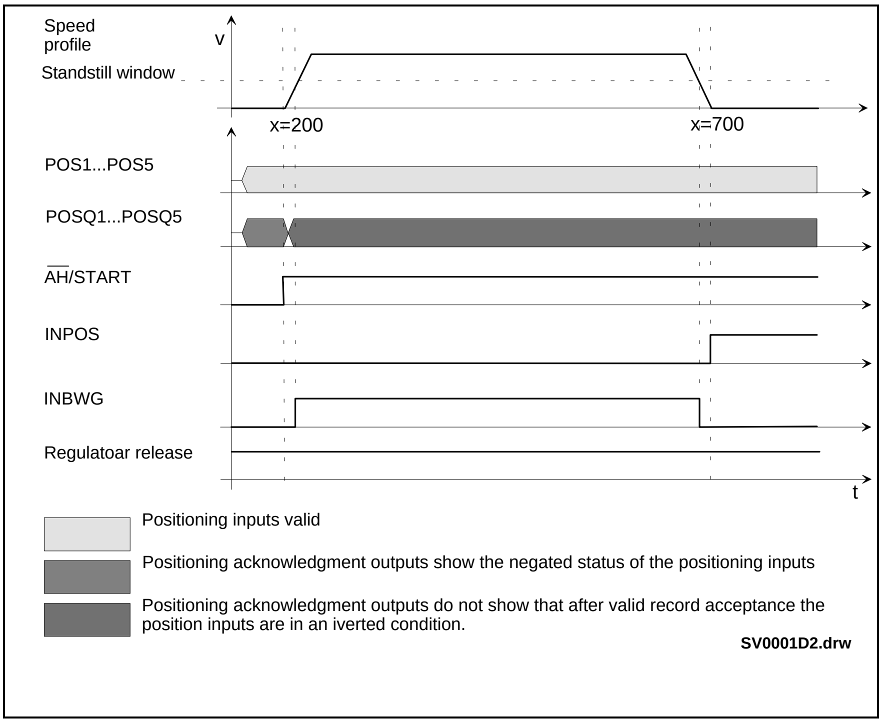


Fig. 5-2: Absolute Positioning Command

Input dialog

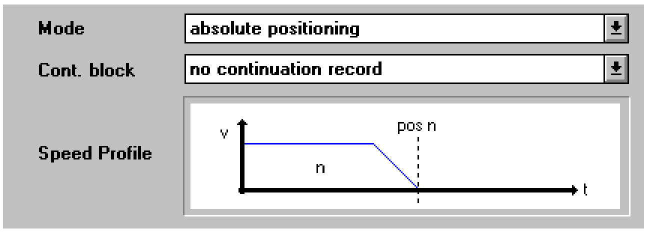


Fig. 5-3: Positioning block input with absolute target position

Requirements for Operating an Absolute Positioning Command:

- The drive must be homed.
- The working area can be restricted to the position limit. Absolute positioning commands will only be completed if the desired position lies within the admissible working area.

Relative positioning block without save residual path

Input dialog

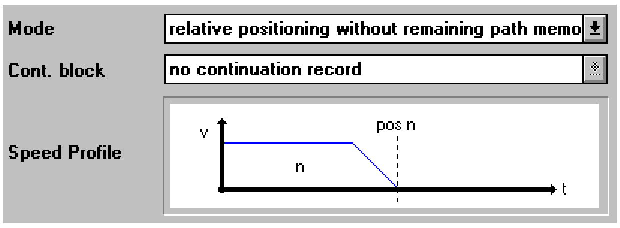


Fig. 5-4: Relative positioning block without save residual path

Through a string of relative positioning commands, a string of distances can be positioned.

Reference position

Given relative positioning blocks without residual save, the **current position** is added to the target position in the positioning block.

Incremental dimension reference

By sequencing relative positioning blocks it is possible to position with incremental dimensioning. Interrupting a relative positioning block without residual distance save means that the reference dimension is lost.

If the positioning block is completed, i.e., the drive reaches target position and the INPOS signal is active, then the incremental dimension can be positioned without loss.

Given an infinitely forward or reverse positioning by sequencing relative positioning blocks (transport band), then the position data must be scaled in modulo format . (Modulo value = length of transport band or modulo format = 2* maximum traversing path.)

Note: If relative positioning without save residual distance is used to traverse incremental dimensions, then it must be noted that the incremental dimensions will always be deleted if a positioning block is interrupted.
Incremental dimension reference can be re-established by traversing positiong blocks or re-referencing.

Example Relative positioning without residual path save with target position = 700 (current position = 200).

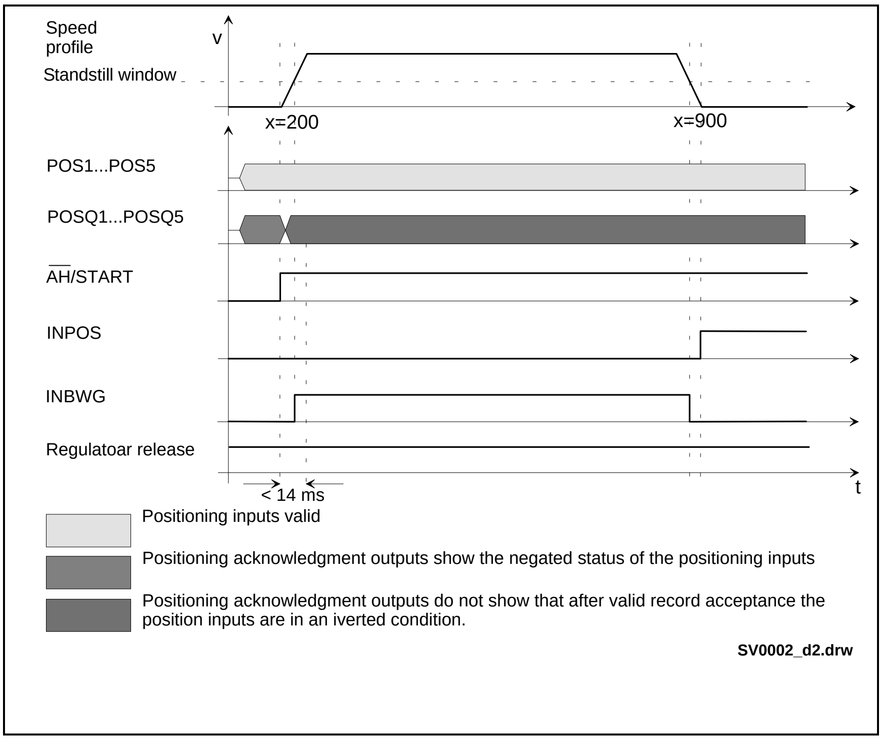


Fig. 5-5: Relative positioning block without residual distance save

Example Relative positioning without residual distance save with target position = 700 (current position = 200). Interrupting and restarting a relative positioning block without residual distance save.

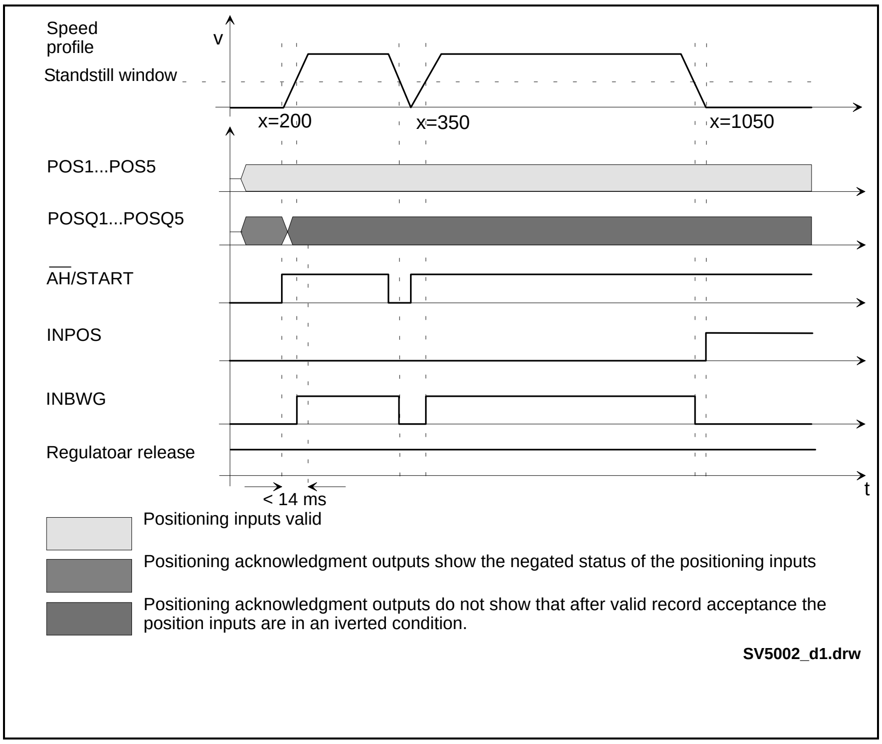


Fig. 5-6: Interrupting a relative positioning block without residual distance save

Relative positioning block with residual path save

Relative positioning block with residual path save is executed if the drive was not homed.

In a relative positioning block with residual path save, the target position is a relative path in terms of the current position.

Input dialog

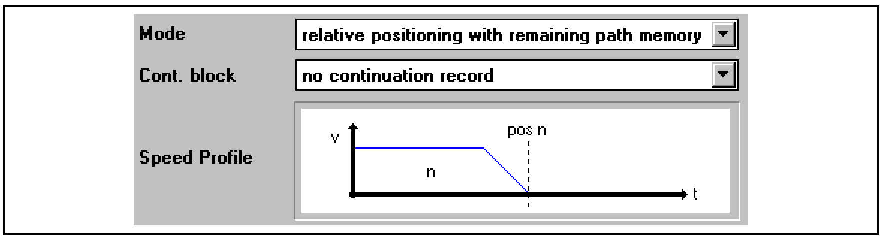


Fig. 5-7: Relative positioning block with residual path save

Incremental dimension reference

By sequencing relative positioning blocks it is possible to position with incremental dimensioning. Interrupting a relative positioning block with residual distance save means that the reference dimension is not lost.

Starting a relative block with residual path save without Interrupt

Behavior

When starting a relative positioning block with residual path save, the target position in the positioning block is added to the current position.

Note: The incremental dimension reference is guaranteed!

Reference position

The current position is used as the reference position.

Example

Relative positioning with residual path save with taget position = 700 without interrupt (current position = 200)

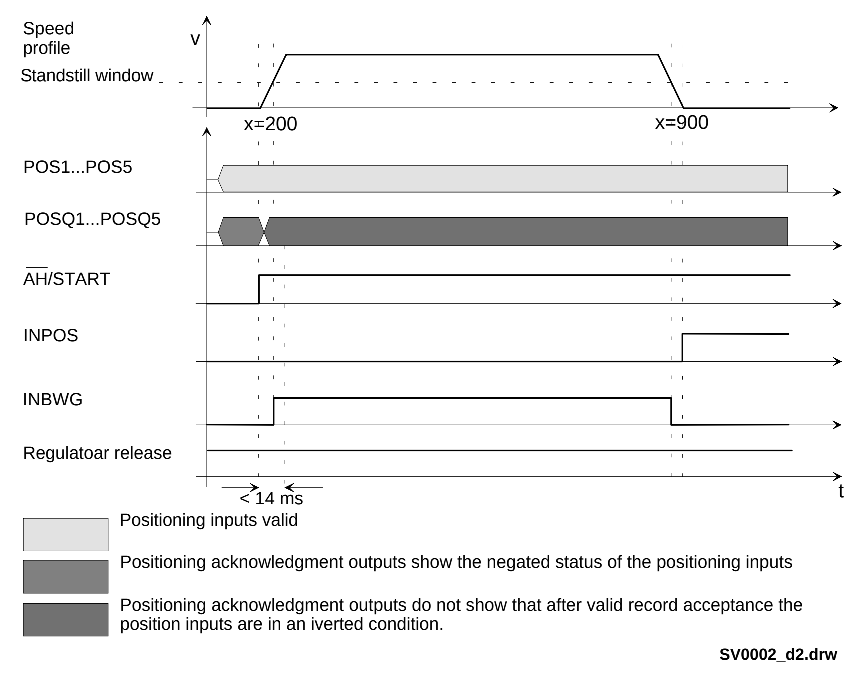


Fig. 5-8: Relative positioning block with residual path save

Interrupting relative positioning blocks with residual path save with drive halt

Reference position

The last InPos message at x=100mm is used as current position.

Note: The incremental dimension reference is guaranteed!

Example

Interrupted relative positioning block with residual path save with target position = 600, reference position =100

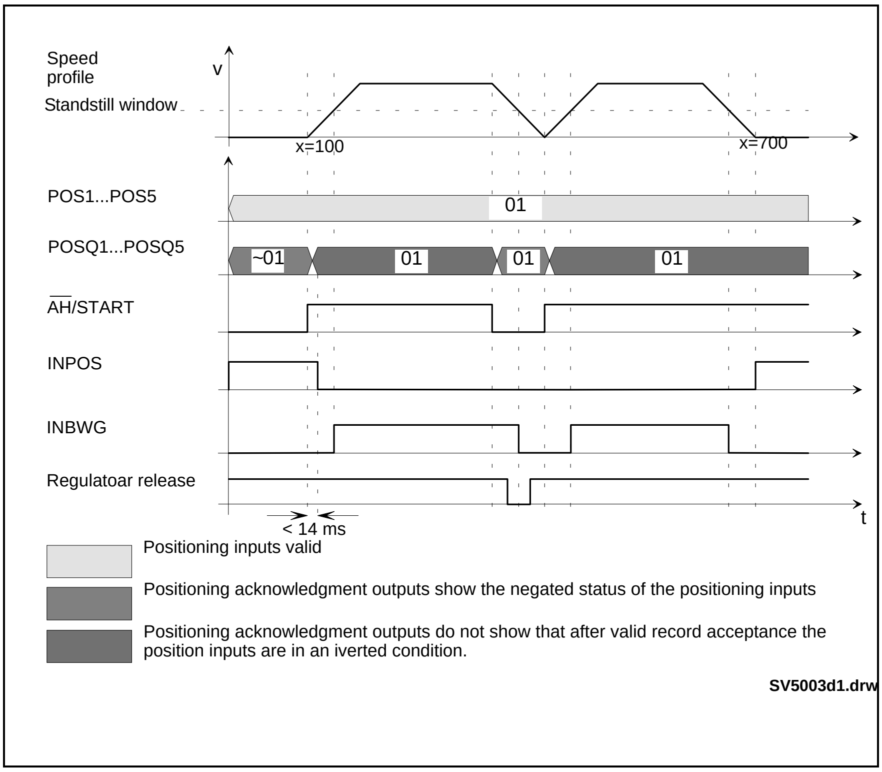


Fig. 5-9: Interrupting relative positioning blocks with residual path storage

Relative positioning block with residual path save after activating drive enable

Reference position

The final InPos message at x = 200 mm is used as the reference position.

Note: The incremental dimension reference is guaranteed!!

Example

Interrupted relative positioning block with residual path save after RF activated with target position = 600

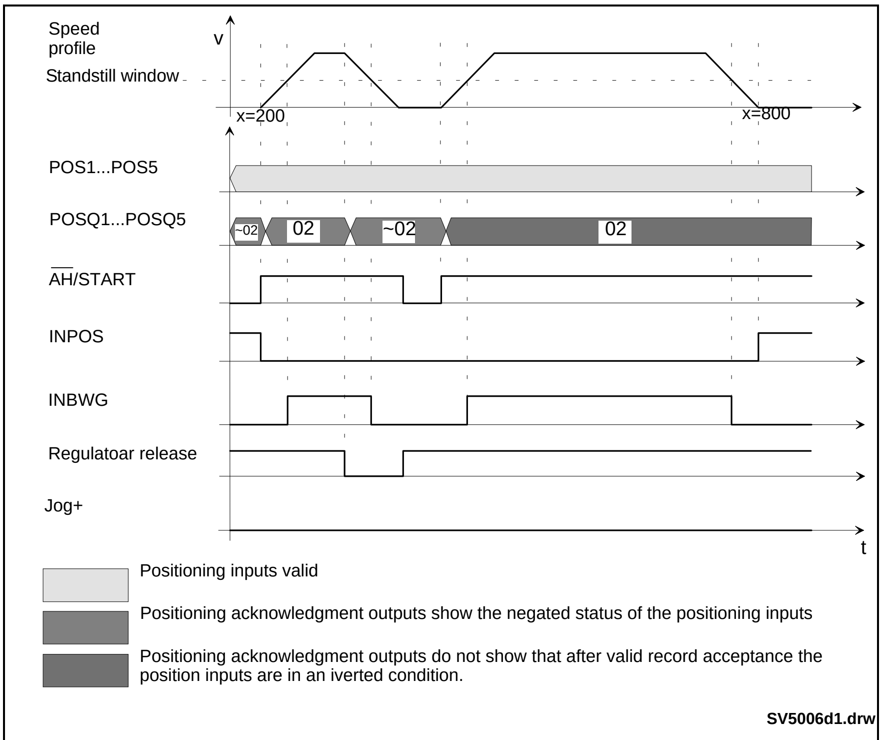


Fig. 5-10: Relative positioning block with residual path save after drive enable activated

Relative positioning block with residual path save after interrupt in jog mode

Example

Interrupted relative positoin block with residual path save after jog mode with target position = 600 without overrunning the **target position** in jog mode.

Reference position

The reference position is the final InPos signal at x=100mm.

Behavior

The distance covered when jogging between interrupt and restart of the positioning block is evaluated.

Note: The incremental dimension reference is guaranteed!!.

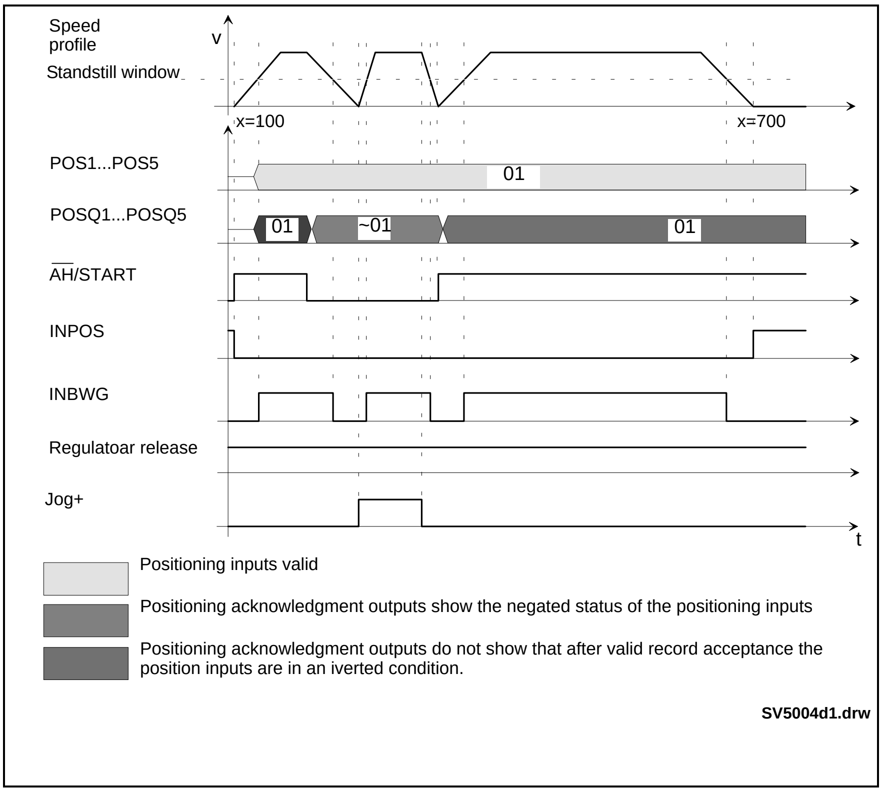


Fig. 5-11: Relative positioning block with residual path save after jog mode

Example Interrupted relative positioning block with residual path save after jog mode with target position = 600 if the target position is overrun while jogging.

Behavior The drive returns to that target position specified prior to interrupt.

Note: The incremental dimension reference is guaranteed!!

Reference position The reference position is the last InPos message with x=100mm.

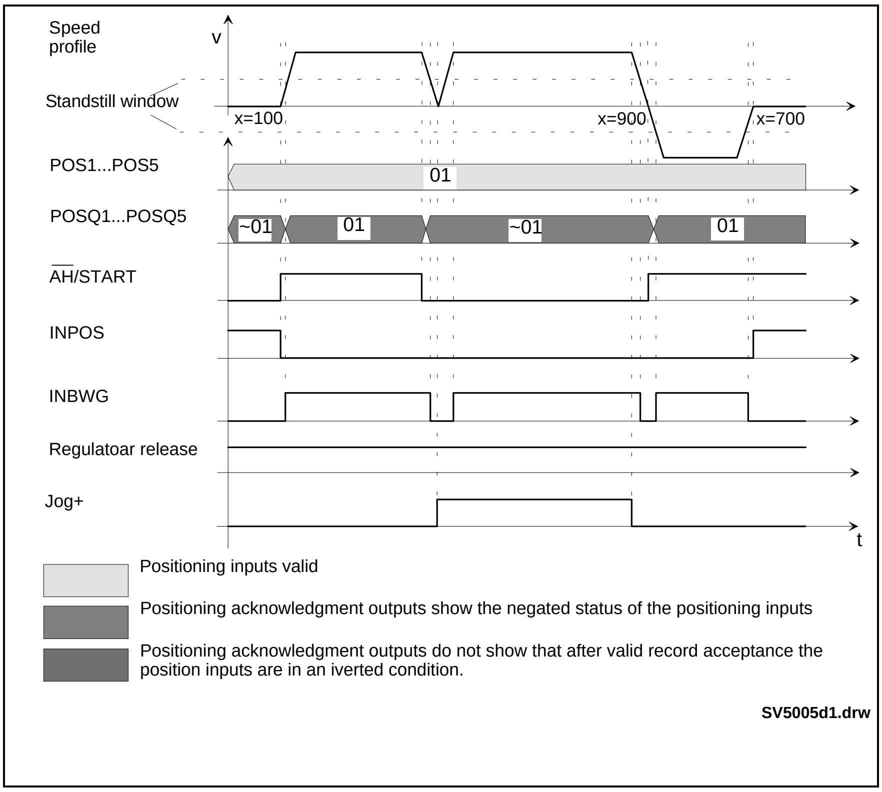


Fig. 5-12: Relative positioning block with residual path save after jog mode

Relative positioning block with residual path save after powering the control voltage of the drive controller down and up after interrupt

Only if an absolute encoder is used will the incremental reference be retained once the control voltage has been powered off and on. The residual path is reained. It is processed after the interrupted relative positioning block is activated with residual path save.

Behavior

If an absolute enocer is used, then the residual path is completed.

If a singleturn encoder is used, then the residual path is ignored and the actual position set.

Note: Incremental dimension reference is only guaranteed if an absolute encoder is used.

Reference position

The reference position with an absolute encoder is the last **InPos** signal with x=200mm.

Example

Interrupted relative positioning block with residual path save after control voltage off and on if target position = 600

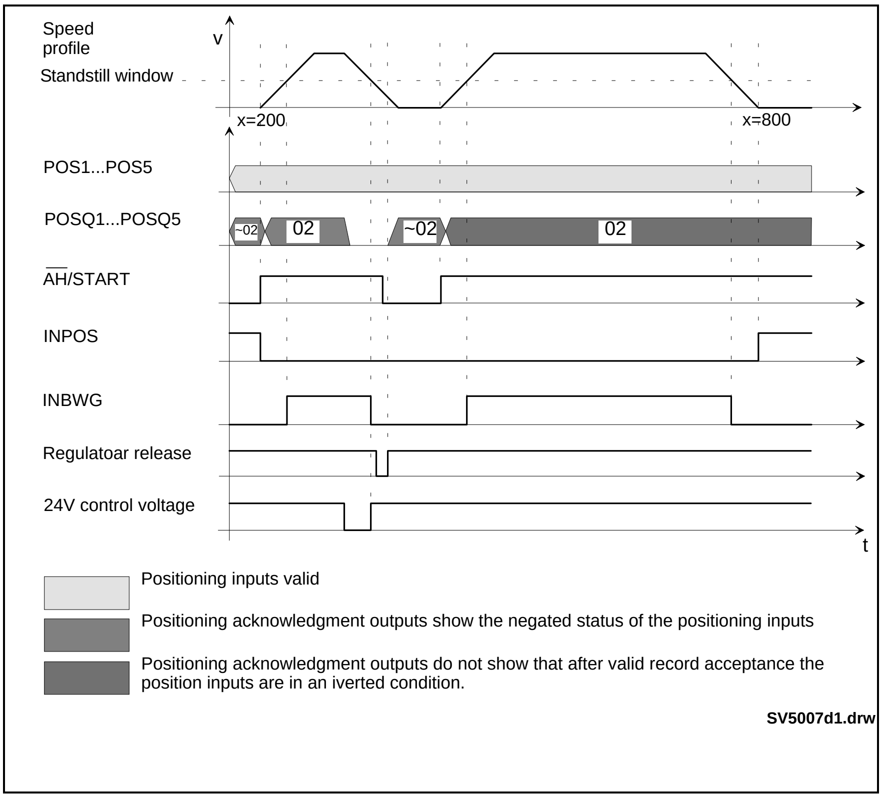


Fig. 5-13: Relative positioning block with residual path save after control voltage shutdown and powered up

Note: If a positioning block is not accepted, then the drive behaves as if it was never started.

Interrupting a relative block with residual path save and starting a new relative block

Behavior

After an interrupted relative positioning block with residual path save, starting a different positioning block means that the residual path of the previously interrupted positioning block is lost.

The relative positioning block then relates to the current position. The incremental dimension will, in this case, not be lost.

Reference position

The reference position is the current position.

Example

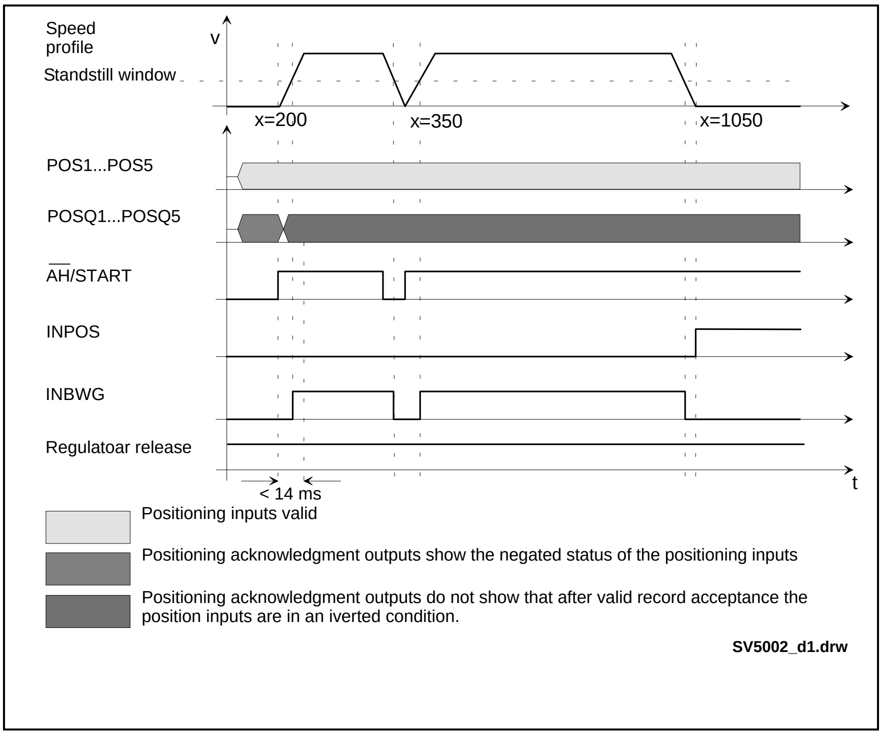


Fig. 5-14: Interrupting a relative block with residual path save and new block select

Continuous Motion in Positive/Negative Direction

Should a motor with defined speed, acceleration and jerk move without a specified position, then the command mode must be specified as: "Movement in a positive direction" or "Movement in the negative direction". The drive controller moves continuously in the given direction until the start signal is removed (i.e. one of the position limits or limit switches is reached).

The desired position is meaningless in this positioning mode.

See also section 10.10 **Jogging**

Input dialog

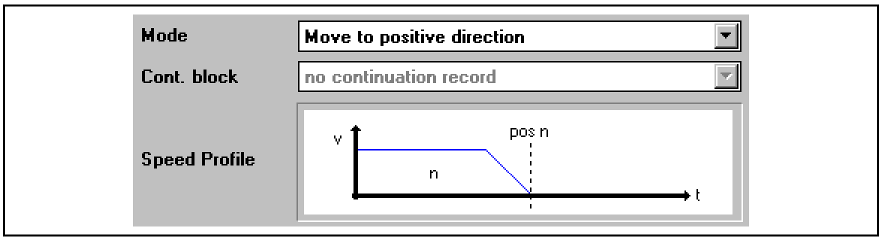


Fig. 5-15 Positioning block input for infinite travel without target position

Example

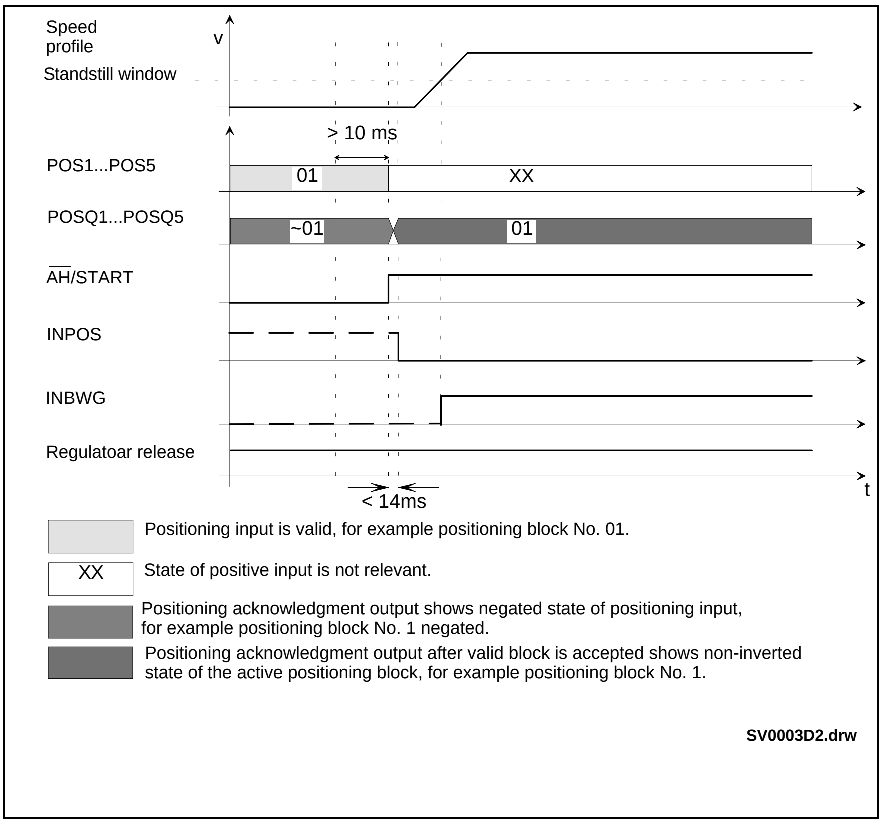


Fig. 5-16: Travelling infinitely in a positive / negative direction

5.4 Following block mode

General information on following block mode

ECODRIVE following block mode permits the processing of several positioning blocks in rapid sequence without having to generate a new start signal each time.

Typical applications are positioning processes during which very long distances at high speeds (rapid traverse) must be covered. This is followed by a positioning at end position at low speed without an interim stop.

- handling robotics accepting or storing transport
- joining processes in mounting installation

A following block chain is made up of a start block and one or several following blocks. The start block is selected in the usual manner and activated. The transition to the following block can take various forms.

Note: Following block mode is possible with absolute and relative positioning blocks with residual path save. The final block of such a sequence is not defined as a following block, which identifies the end of the following block sequence.

Selecting and activating a following block

Selecting and activating a block with following block takes place as usual. The following block is always that block with the next highest block number. A following block can be followed by a following block which means that up to 63 following blocks can be set after one start block. The following block of block number 63 is block 0.

See also section 5.5 **starting positioning commands**

Indexing in following block mode

Two basically different indexing modes are possible. These, in turn, can be broken down still further.

Positioning-dependent block indexing

In positioning-dependent block indexing, the following block is switched into at the target position of the block start. There are three different types of block transitions:

- **Block transition at old positioning speed (mode 1)**

In this mode, the target position of the start block is traversed at the speed of the start block. This is followed by a switching to the positioning speed of the following block.

Definition

The drive positions at target position **n**, which is in the current position bock **n.** As soon as this target position is exceeded, the drive switches to the next process block, i.e., **n+1.**

Input dialog

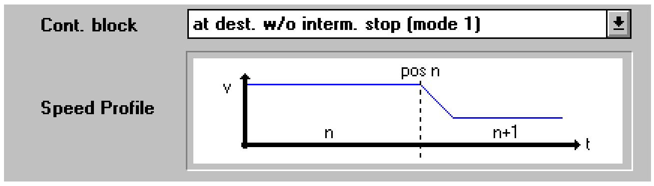


Fig. 5-17: Positioning block input with folownig block mode 1

Example

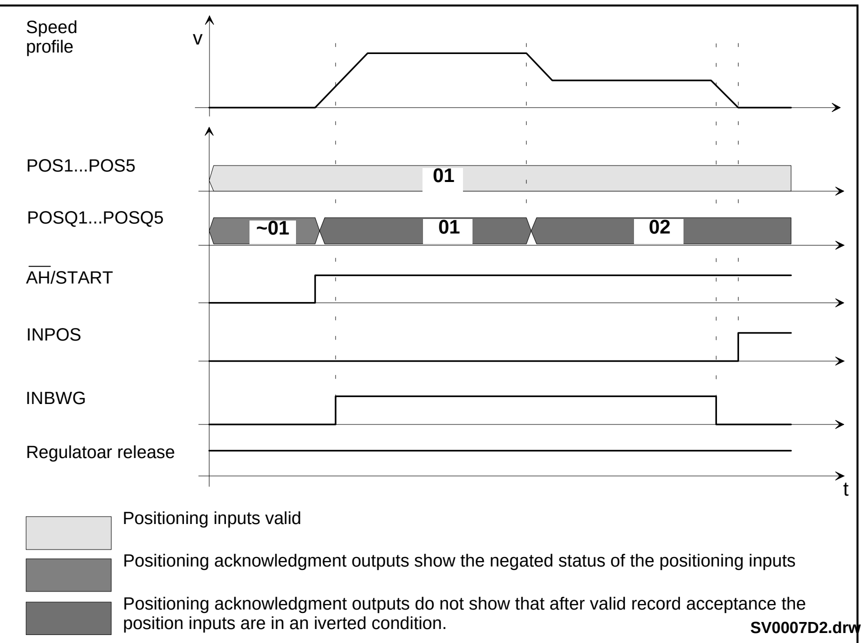


Fig. 5-18: Position-dependent block indexing (mode 1)

- **Block transition at new positioning speed (mode 2)**

In following block mode 2 with positioning-dependent indexing, the target position of the start block is traversed with the positioning speed of the following block. The decel and accel processes needed to adjust the speed, are already performed in the start block.

Definition

The drive runs in the direction of the target position $\mathbf{X_n}$, located in the current position block **n**. There is then an acceleration at accel $\mathbf{a_n}$ to the next positioning block $\mathbf{v_{n+1}}$ so that this speed $\mathbf{v_{n+1}}$ can be reached at the target position $\mathbf{X_n}$,.

It is not possible, however, to switch to the next positioning block until the target position has been overrun.

Input dialog

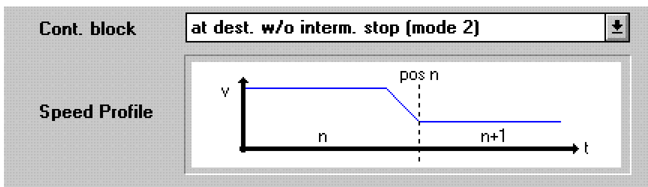


Fig. 5-19: Positioning block input with following block mode 2

Example

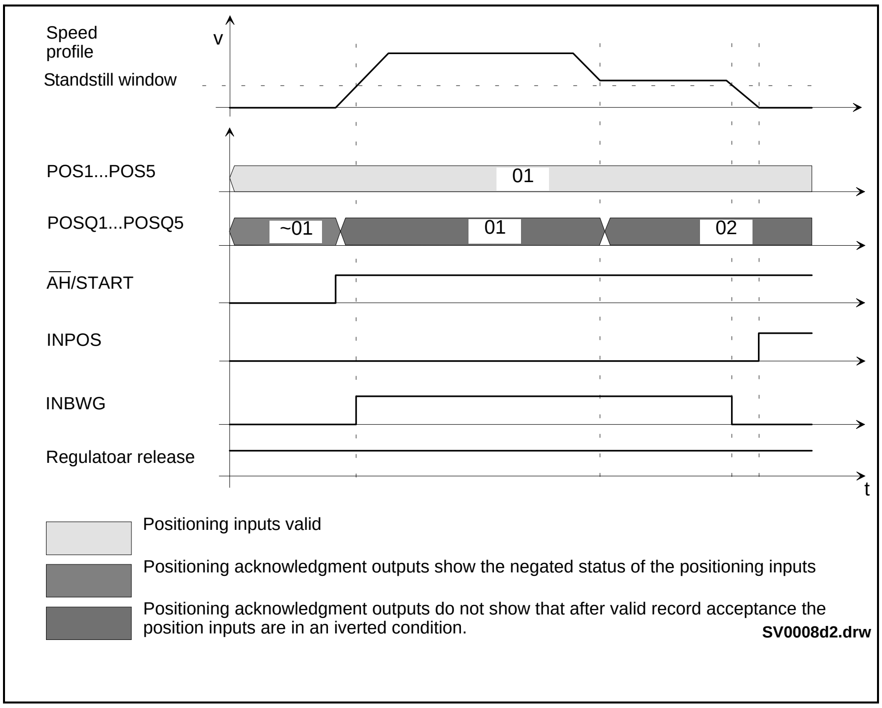


Fig. 5-20: Positioning-dependent block indexing (mode 2)

- **Block transition with intermediate halt**

In block transition with intermediate halt, the drive goes to the target position of the start block. If the position command value has reached the target position, then the following block is automatically started without the necessity of generating an external start signal.

This means:

Definition Transition when overruning a target positon with intermediate halt represents another operating mode.

In this case, the drive goes to speed 0 at the target position and then accelerates to the new positioning speed.

Note: Indexing occurs, if the internal command value generator reaches the target position. With very small jerk values, the target position is creeped to , whereby the creeping is equal to the dwell time.

Input dialog

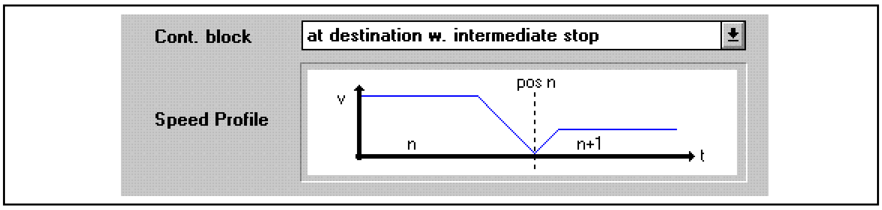


Fig. 5-21: Positioning block input with following block and intermediate halt

Example

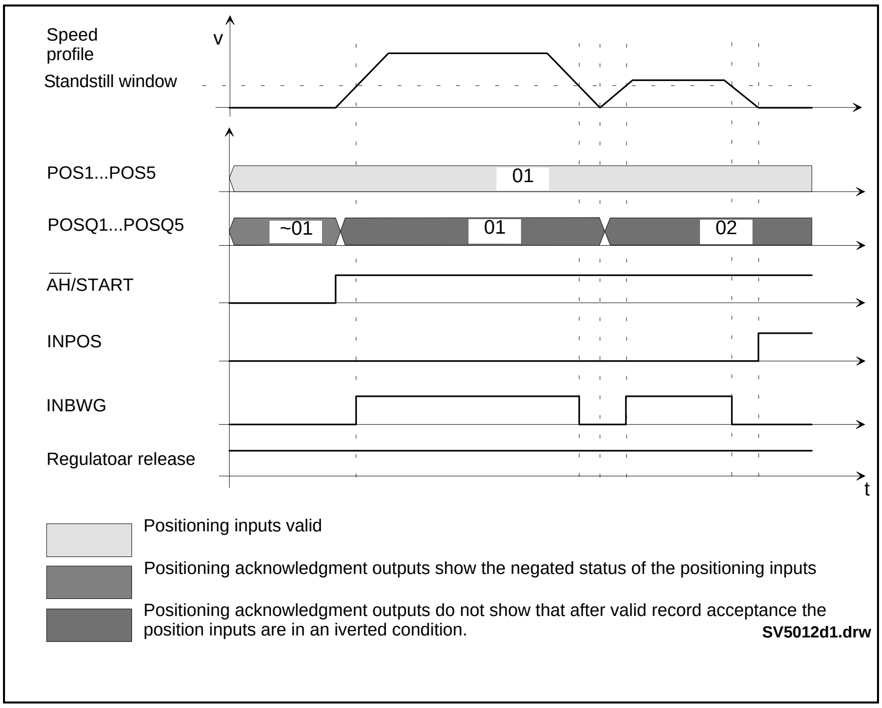


Fig. 5-22: Following block indexing with target position with intermediate halt

Note: This mode must be used if there is a directional change in two sequential following blocks within one following block sequence. Otherwise, it is inevitable that the position at which the direction change takes place will be overrun.

Switch signal dependent indexing

Note: If switch signal dependent block transition is used, then the function "travel range limit with travel limit switch" cannot be used.

Block indexing to the block with the next highest block number is triggered by an external switching signal.

- **Transition with switch cam (external switching signal)**

The switching signal dependent block indexing makes a transition to a following block possible with an external switching signal. The two end switching inputs of ECODRIVE can be used.

Input dialog

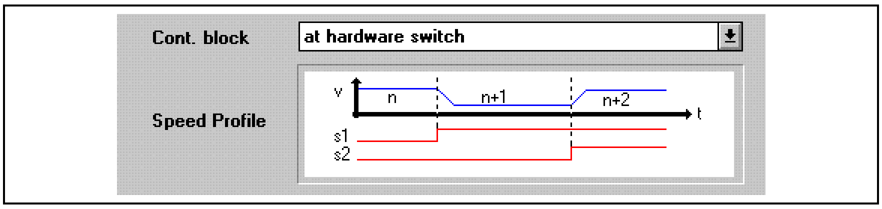


Fig. 5-23: Positioning block input with following block after switching signal

Definition

The drive goes to the next processing block n+1 as soon as the input of following block cam 1 (limit+) goes to **0->1.** If the target position is not reached, then a new positioning block will be switched into.

The drive goes to the next processing block n+2 as soon as the input of following block cam 2 (limit) goes to **0->1.** If a following block cam is activated during the process, then the drive goes to the next positioning block.

Reference position

A following, relative positioning block relates to the position at which the following block cam was switched into.

Cam switch table

Limit-	Limit+	Drive reaction
0	0	drive goes to target position from block n
X	0->1	block n+1 is started
0->1	X	block n+2 is started

Fig. 5-24: Drive reaction with different switching signal frequencies

X = Don't Care

n = positioning block selected via the parallel inputs or the serial interface

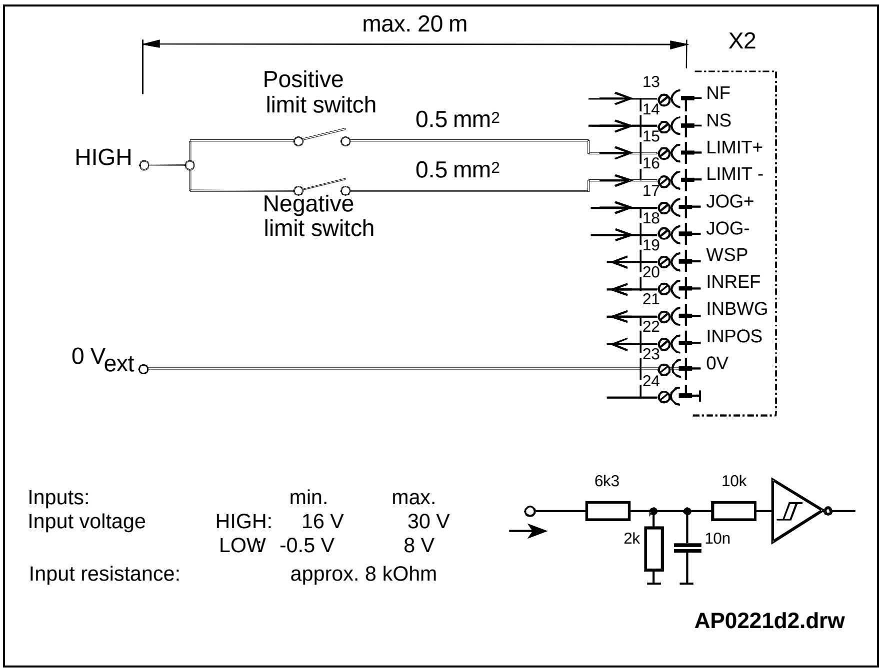


Fig. 5-25: Terminal diagram limit +/-

Example

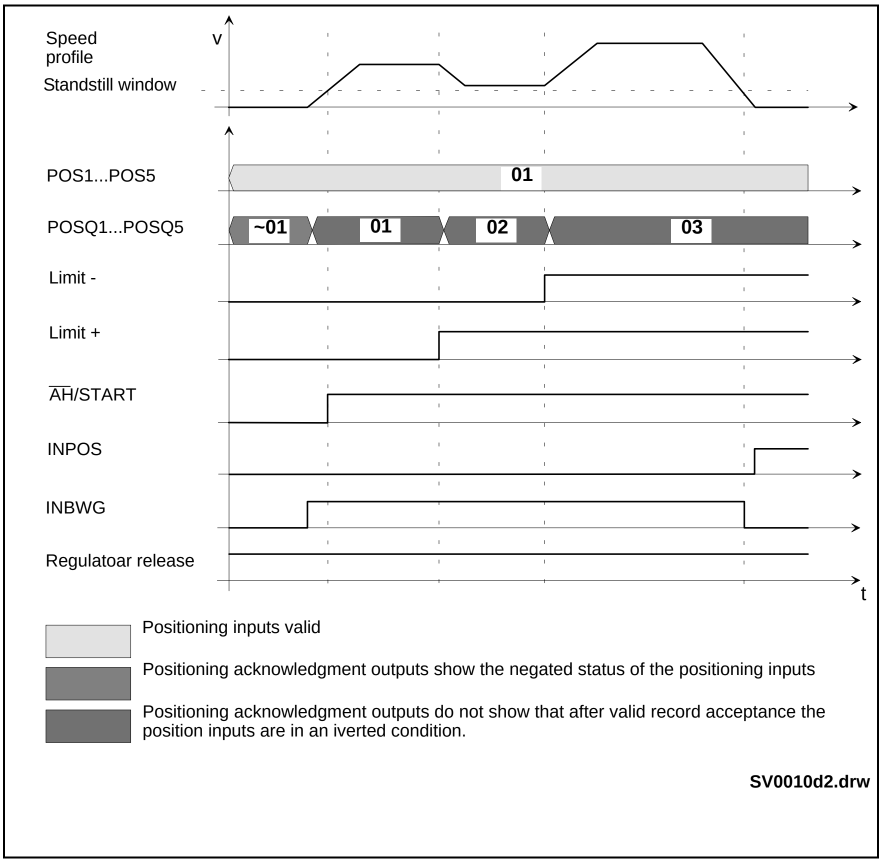


Fig. 5-26: Switching signal dependent block indexing

Switching signal for block indexing not detected

The start block of a switching signal dependent following block can be either an absolute or relative positioning block. This means that if the switching signal for block indexing does not arrive before the target position was reached, then the drive will halt. If a switching signal is then applied, then the drive will conduct the following block.

Example

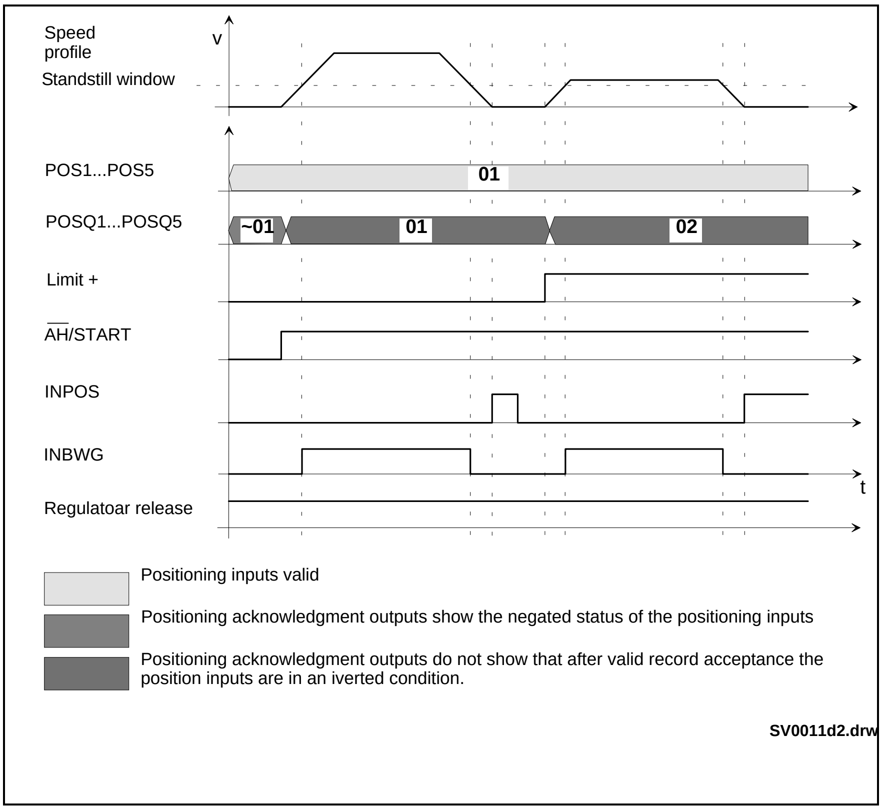


Fig. 5-27: Switching signal dependent block indexing (behavior with no switching signal)

Note: All four indexing conditions are constantly queried and evaluated so that the correct following block is switched into even after a following block sequence was interrupted. However, only the first indexing condition occurring during an interrupt is recognized. All others are not acknowledged.

Starting a following block sequence

The entire following block sequence is started by applying the start signal, if the first following block of a following block is selected.

Reference position

Current actual position value (usually identical with the target position of the final block).

Example

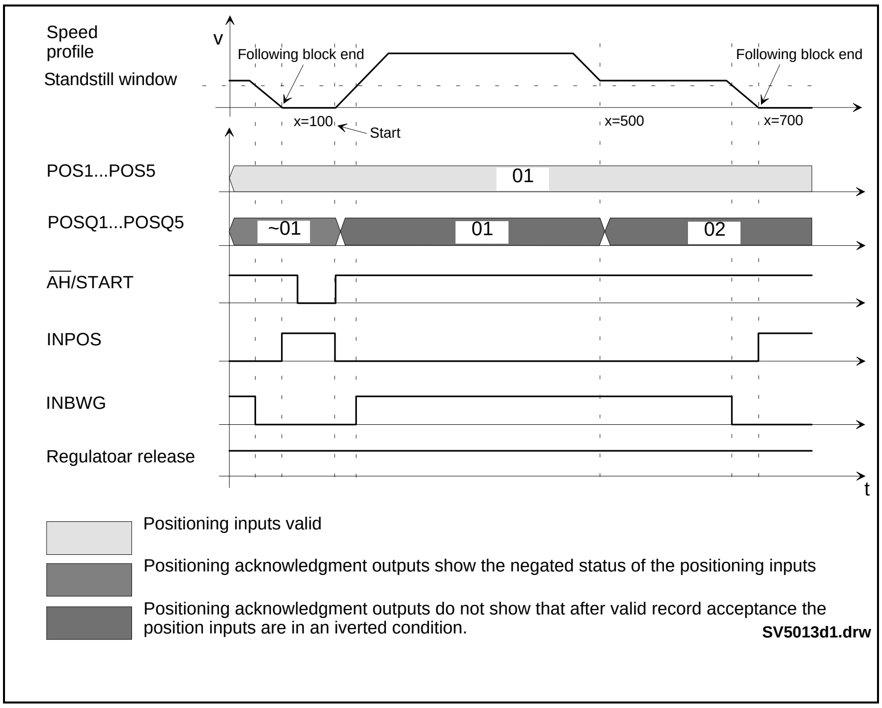


Fig. 5-28: Starting a following block sequence

Interrupting a following block sequence

An interrupt can result

- if the drive enable is removed
- or if drive start is removed

Depending on the type of block of the following block sequence interrupted and the events of this interruption, the following block sequence is processed differently after a restart.

Note: In following block mode, only relative positioning blocks with residual path save are permitted as otherwise the incremental reference dimension is lost with an interrupt.

Interrupting a following block sequence when selecting thesame block number

In the case of an interrupt (e.g., with drive halt), the following block sequence is completed with a restart.

Reference position

Reference position is the original start position of the following block sequence (also usually the InPos message).

The incremental reference dimension is retained because only absolute and relative positioning blocks are used with residual path save in following block mode!

Example

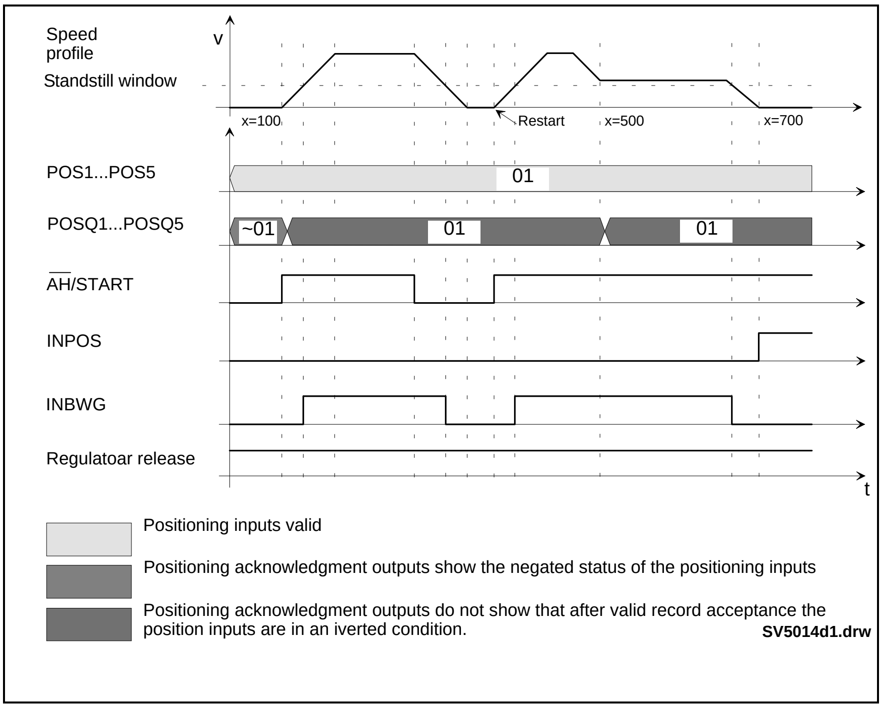


Fig. 5-29: Following block interrupt with identical blocks selected

Changing into jog mode

Note: Given a change into jog mode during an interrupt, the previously interrupted following block sequence is completed upon restart if no new block has been selected.

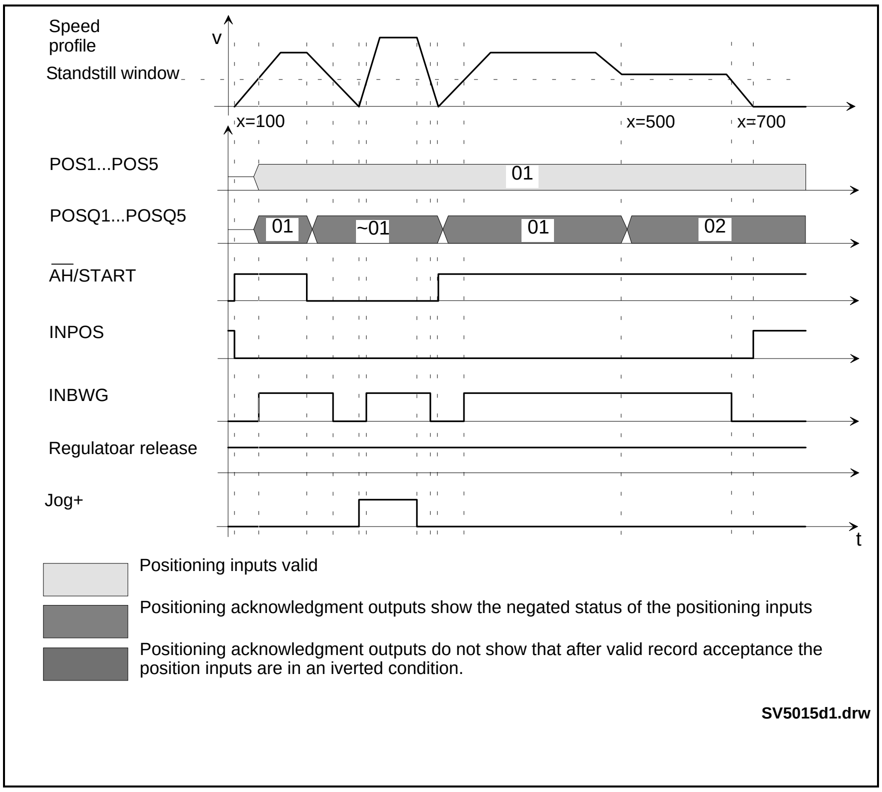


Fig. 5-30: Following block interrupt with jogging without target position overrun

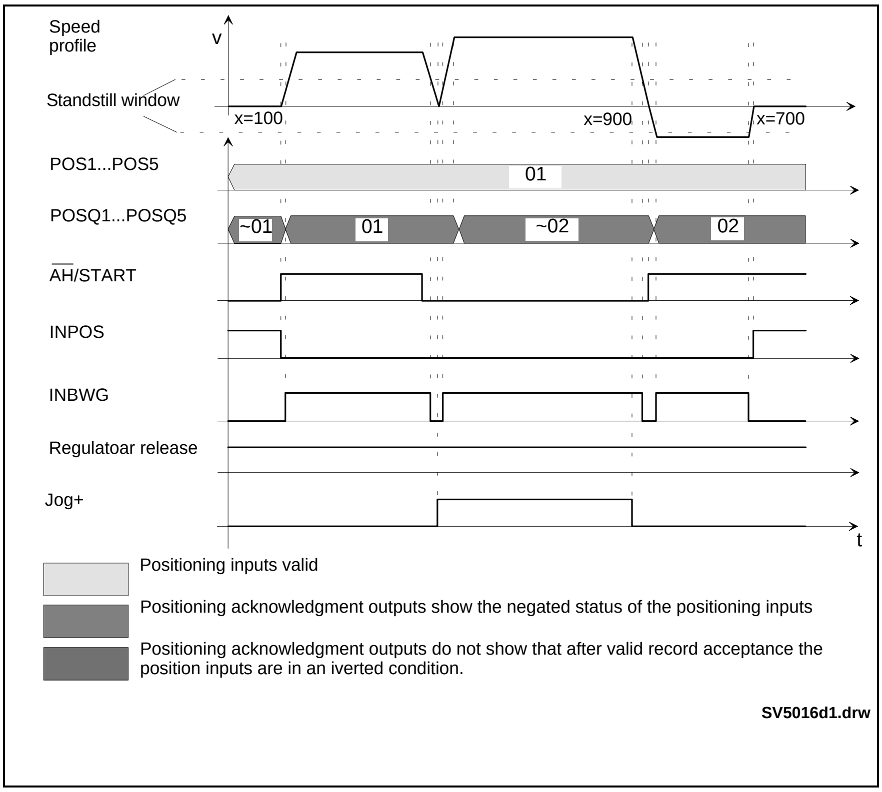


Fig. 5-31: Following block interrupt with jogging with target position overrun

Note: When jogging, only one indexing command is acknowledged and evaluated. This means that only the first overrun target position or switch cam is detected and evaluated. This position value is then used as the reference position.

Interrupting a following block sequence with new block number selected Block number

If during an interrupt (eg., drive halt), a new block number is selected, then the previously interrupted following block sequence is not completed upon restart, but instead the current block is completed.

Reference position Current actual position value.

Example

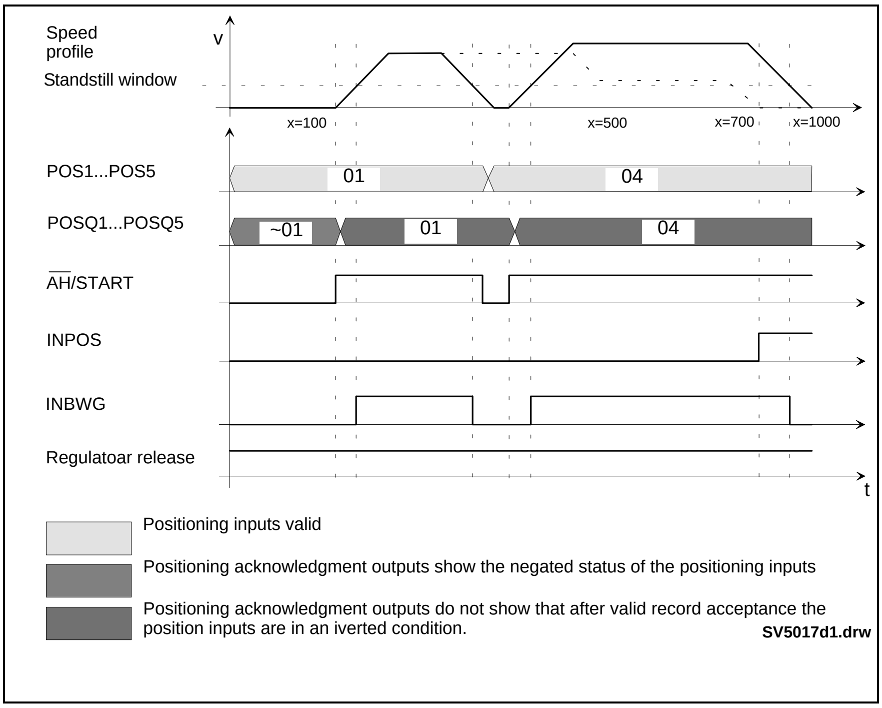


Fig. 5-32 Following block interrupt with new block selected

Note: The incremental reference dimension is lost if the folowing block is interrupted.

Following block sequence interrupted with power failure

If the 24V power source fails, then the incremental reference dimension could be lost.

Reference position In this case, the actual positon at the time of powering up is assumed.

If an absolute encoder is used (multiturn), then the actual positon at shutdown $\mathbf{X_{Off}}$ and the actual position when powering up **Xon** are identical, if it has not been moved. If a singleturn encoder is used, however, then $\mathbf{X_{off}}$ and $\mathbf{X_{on}}$ are not identical as $\mathbf{X_{on}}$ can still be any value within a motor period.

Note: All previously recognized indexing conditions (e.g., switch cams) are deleted.

Example

Interrupted relative positioning block with residual path save of a following block after control voltage off and on with target position = 500

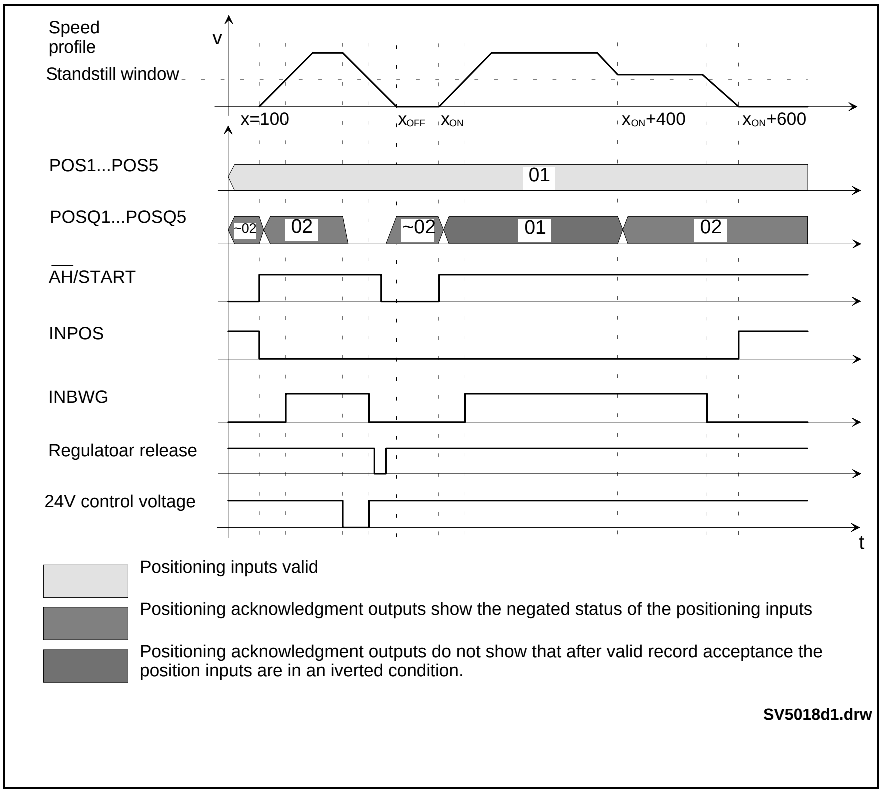


Fig. 5-33 Following block interrupt with control voltage power up and down

Following block sequence interrupt with absolute following block

Given absolute positioning blocks, an interrupt presents no problem as the reference dimension is always guaranteed.

With select a new block number

If a new block is selected during an interrupt, then the interrupted following block is not completed with a restart but rather the currently selected block is executed.

With select the same block number

If a new block number is not selected with an interrupt, then the interrupted following block will be completed upon restart.

Note: In both cases, the current actual position is assumed. The incremental reference dimension is retained due to the absolute block.

Parametrization notes for following blocks

Taking drive limits into account

When parametrizing following blocks, it is necessary to take the maximum values of the drive into account.

These are:

- maximum accel capacity
- maximum speed

If blocks are parametrized having drives with values exceeding maximum values, then this inevitably generates a lag error. The drive will then signal error **F228 excessive deviation,** informing that it cannot comply with the position command value.

Minimum value for accel and jerk

General information

Accel values that are too small can also cause problems. This means that when determining positioning blocks the following formula must be **noted**:

- **Minimum accel value**

$$\text{accel} > \frac{\text{speed difference}^2}{2 \cdot \text{target position difference}} = \frac{\left(\mathrm{v}_{\mathrm{n+1}} - \mathrm{v}_{\mathrm{n}}\right)^2}{2 \cdot \left(\mathrm{X}_{\mathrm{n+1}} - \mathrm{X}_{\mathrm{n}}\right)}$$

Abb. 5-34: Minimum accel value in following block mode (translatory)

with

$$X_n = \text{target position of block n}$$

$$X_{n+1} = \text{target positon of block n} + 1$$

$$v_n = \text{speed of block n}$$

$$v_{n+1} = \text{speed of block n} + 1$$

Note: The above-referenced relation applies to an infinite jerk which correspons to a jerk filter that is off (=0). If a jerk filter is used, then the calculated values should first be approximately doubled. The path to be covered in one block and its speed are generally process dependent. If the minimum accel value calculated using the above formula already causes the maximum value to be exceeded, then a lower positioning block speed must be selected.

- **Minimum jerk value**

See also **Fig. 5-38: Jerk limit with linear scaling and Fig. 5-39: Jerk limit with rotary scaling.**

If the parametrized accel values are too small, then it could mean that the parametrized speeds will not be achieved. A so-called "triangular mode" is then executed.

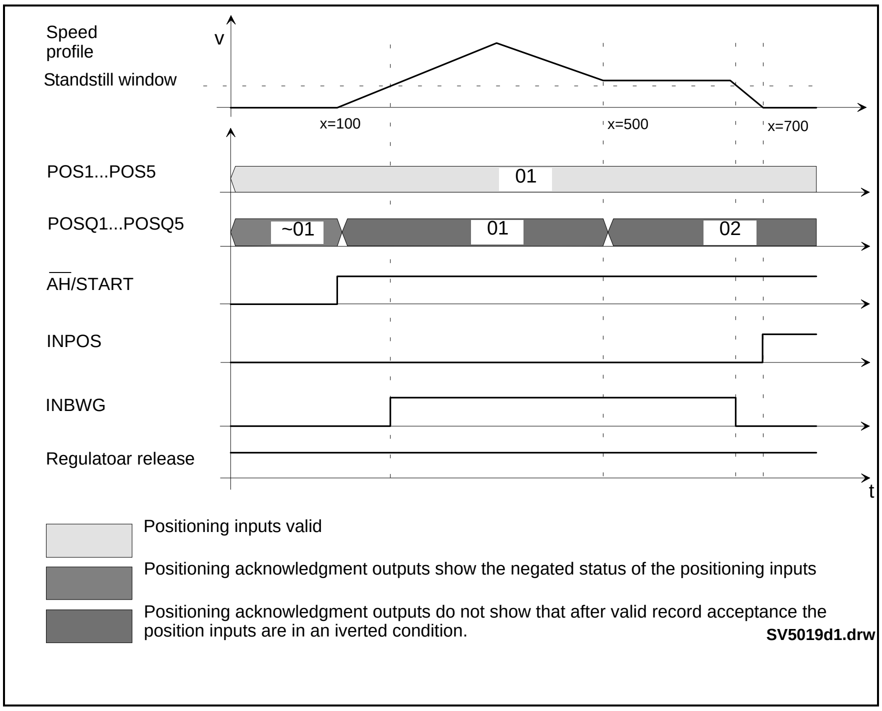


Fig. 5-35: Triangular mode with accel values that are too small

Change of direction within a following block sequence

Note: If while changing from block n to block n+1 of a following block, the direction was changed, then, for block n, the mode "Switching with target position with halt" must be used to make behavior oscilation free.

Explanation

Following block n with mode 1 followed by following block with intermediate halt as there is a reversal of direction with the transition from block n to block n+1.

This means that a change in qualifying sign for speed takes place with target position n+1 instead. If the accel parametrized in block n+1 does not suffice to decel within the path diferent = X_{n+1}-X_n from speed v_n to 0, then the parametrized target position X_{n+1} will inevitably be overrun.

This can trigger both the software and hardware limit switches.

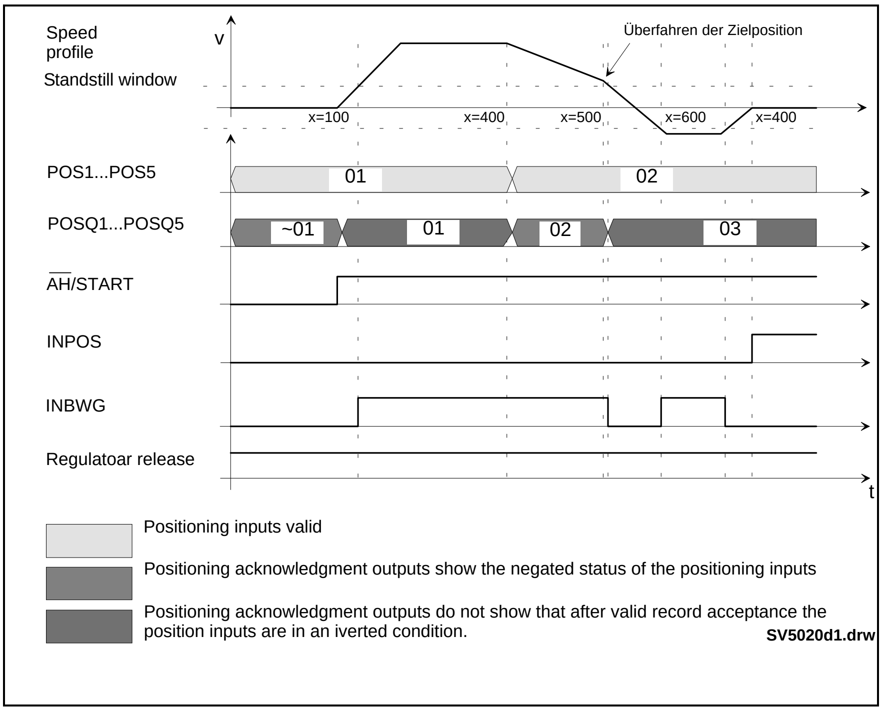


Fig. 5-36: Parametrizing a following block with directional change

Note: In this case it is urgently necessary to take the above-referenced formula for minimum accel into account to avoid any overrunning of the position!

5.5 Positioning Command Input

Positioning command data will be established via the positioning command input window.

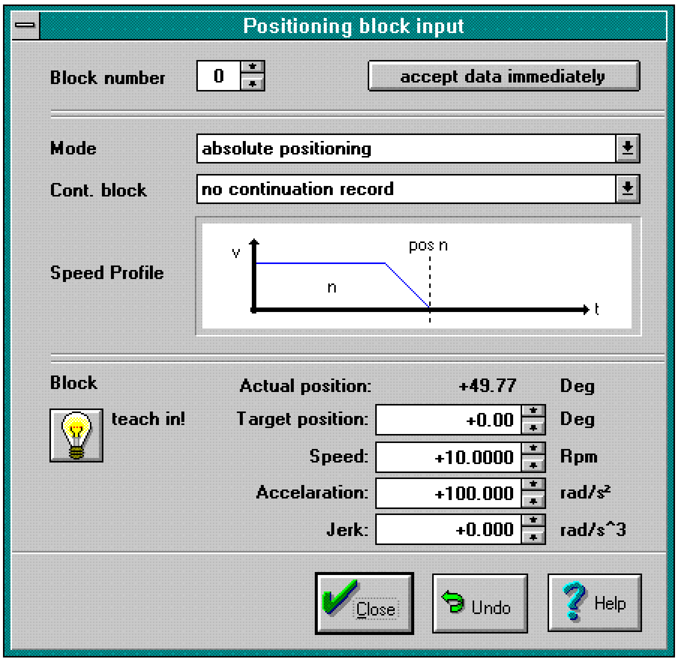


Fig. 5-37: Positioning Command Input

Command Number

The command number indicates the address of the positioning commands where these commands can be pulled up under the command directory.

Positioning Command Data

Desired Position

The position at which the drive controller should be positioned is supplied from the input array of desired positions. The desired position, independent of the positioning mode, can be relative or absolute.

See also **P-0-4006, process block target position**

Teach-In actual position

The teach-in function assumes the current actual position as the target postion of the block to be viewed.

Velocity

The positioning velocity, with which the desired position will be reached, can be established here. Via feedrate override, it is possible to dynamicaly change the velocity during positioning. The function positioning with limited speed can also be used.

See also **P-0-4007, process block velocity and S-0-0259, positioning velocity**

Acceleration

The positioning acceleration, with which the drive accelerates and decelerates, can be defined for each positioning command. The jerk of the acceleration occurs in consideratio of the following points:

- Maximum torque of the motor in terms of the motor and drive controller combination
- Inertial and frictional torque of the connected mechanical system

Note: Both of these parameters are automatically determined with the control settings and "maximum parametrizable acceleration" is calculated P-0-0168. This value should be viewed as a suggested value and is automatically displayed at the end with the control setting.

If acceleration is physically not possible (too big), then expect error **F228 excessive deviation**.

Accel values that are too small mean tht the parametrized position speed cannot be reached. This presents a problem in connection with following block mode (see parameter notes for following block mode).

See also **P-0-4008, process block acceleration**

Jerk

(The acceleration change of a motion in terms of time is defined as a "jerk".)

A "jerk" will represent the acceleration change of a movement in terms of time. ECODRIVE presents the opportunity to limit the jerk of a motion.

The jerk limit will be set to avoid vibrations which acceleration or deceleration will generate. This specific effect can be caused, in particular, with a moveable stiff mechanical system.

Instructions for installing a positioning jerk

In most cases the jerk limit is not required and should be turned off during the startup procedure. The jerk limit will be deactivated if set to zero.

If unacceptable vibrations in the acceleration and deceleration phase of the positioning procedure occur, then minimize the vibrational inducement of the mechanical system by gradually changing the positioning jerk.

The maximum value of the jerk should be reduced until the positioning motion becomes acceptable.

See also **P-0-4009, process block jerk**

A rough approximation validating the jerk limit:

$$Jerk\ [\frac{mm}{s^3}] > 2 \cdot \frac{\left(\text{Acceleration } [\frac{mm}{s^2}]\right)^2 \cdot 60\ [\frac{s}{\min}]}{\text{Speed } [\frac{mm}{\min}]}$$

Fig. 5-38: Jerk limit with linear scaling

$$\text{Jerk } [\frac{\text{rad}}{\text{s}^3}] > 2 \cdot \frac{(\text{Acceleration } [\frac{\text{rad}}{\text{s}^2}])^2 \cdot 60\ [\frac{\text{s}}{\text{min}}]}{\text{Speed } [\frac{\text{Umdr}}{\text{min}}] \cdot 2 \cdot \pi\ [\frac{\text{rad}}{\text{Umdr}}]}$$

Fig. 5-39: Jerk limit with rotary scaling

Positioning Mode

Positioning mode is fixed whether we are dealing with or without relative residual path save, absolute or positioning block without target position. Additionally, it is possible to set, using a selection list, wether the following positioning block is to be executed or not (following block mode).

A differentiation is made as follows:

- relative with residual path save
- relative without residual path save
- absolute
- following block
- travel in a positive direction
- travel in a negative direction

Data Receiving

The set positioning command data is not initially active. After the positioning command is sent, the data is first written into the drive controller. During setup it is helpful if the data can be tested directly, as, in this case, all the given positioning commands can be loaded into the drive controller through the "Data Transmission" key without the window having to leave the screen.

5.6 Choosing, Starting and Selecting a Positioning Command

Choosing a Positioning Command

There are five binary position command selection inputs in the DKC01.1, POS1...POS5. The command number of the desired positioning command is selected as binary signal types in the command.

Starting Positioning Commands

If an edge is applied to hardware input AH/start of the Ecodrive (analog unit), then the selected positioning blocks will be started at least 1.5 ms thereafter but no more than 12 ms later.

Note: Timing is outlined in the illustration on acknowledging positioning block selected (see Fig. 5-40: Acknowledgement with positioning bln the next section).

Interrupting Positioning Commands

Positioning commands can be interrupted during the command operation by removing the start-signal (AH/START = logic 0).

Acknowledging position block select with drive enable active

Drive halt If the drive is in "drive halt" (AH/start signal not active) then the complement of the positioning input signals is generated at the acknowledgement outputs.

Start drive After activating AH/start signal, it is checked whether the selected positioning block may be assumed. If it is, then the binary coded number of the accepted positioning block appears at the acknowledgement outputs.

In the case of non-executed positioning blocks, the complement of the number of the selected positioning block is generated.

Note: After activating the AH/start signals, the transfer of the new positioning commands will be acknowledged after < 14 ms with the command selection acknowledgement outputs. At the same time the drive controller will set the "In Position Output" = logic 0 if the new position is not reached.

Acknowledging the executed positioning block

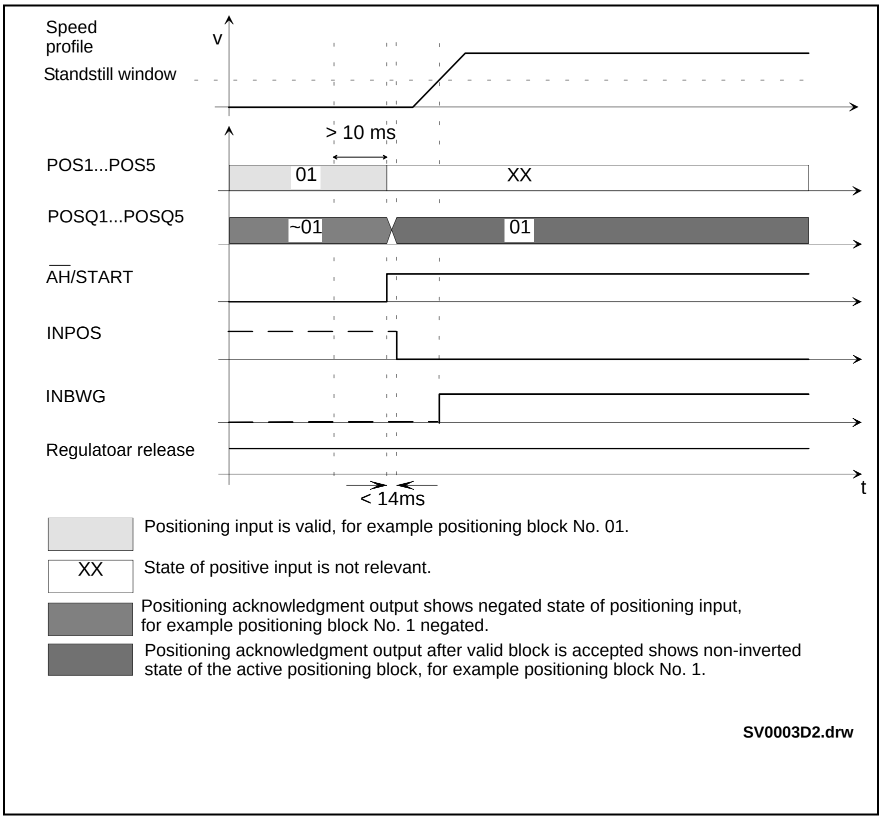


Fig. 5-40: Acknowledgement with positioning block executed

Acknowledgement with non-executed positioning block

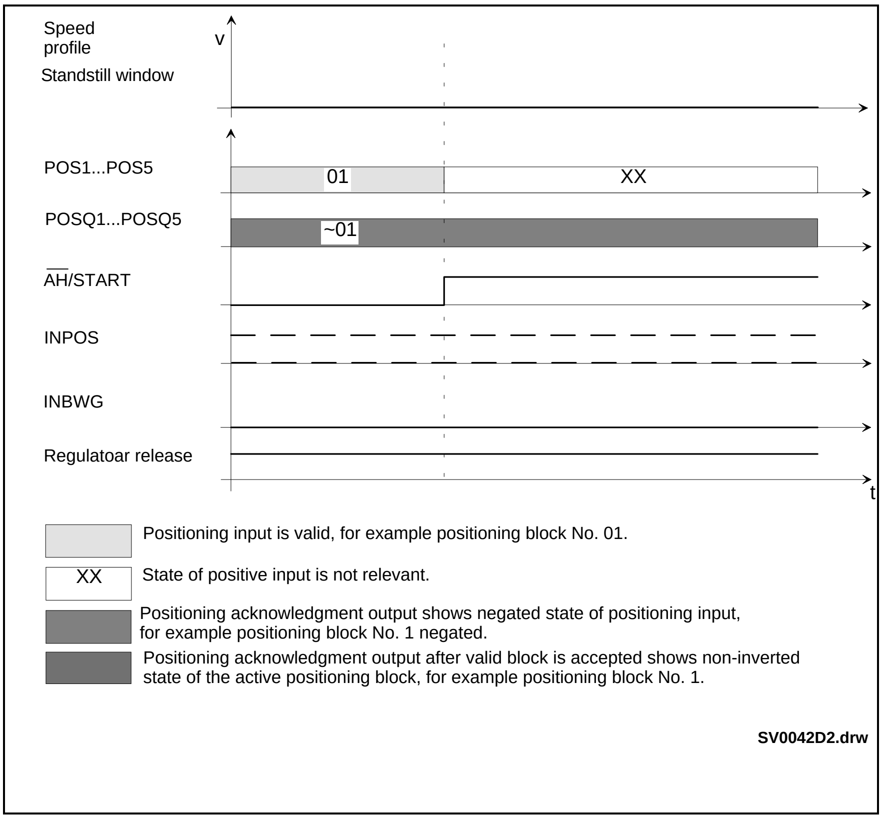


Fig. 5-41: Acknowledgement with non-accepted positioning block

Acknowledgement of following blocks

In following block mode, the number of the process block just reached is acknowledged.

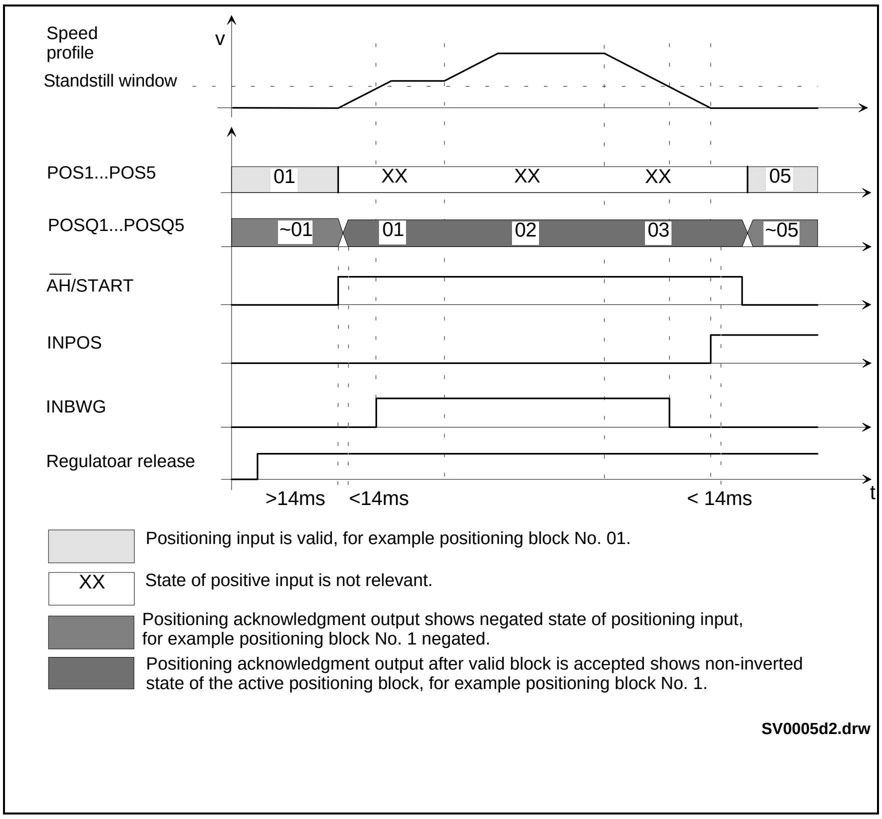


Fig. 5-42: Acknowleding following block mode

Acknowledging drive enable off

Once the drive enable is off, the last assumed positioning block appears at the acknowledgement output. If the drive is at the target positon of the last accepted positioning block, then the message INPOS is additionally generated.

Note: The INPOS message is retained even if drive enable is off.

Exceptions: If the drive was referenced directly prior to removal of the drive enable, or if jog mode was implemented, then the INPOS signal of the drive enable could be cleared with shutdown.

In the example below, the same absolute positioning block is started again.

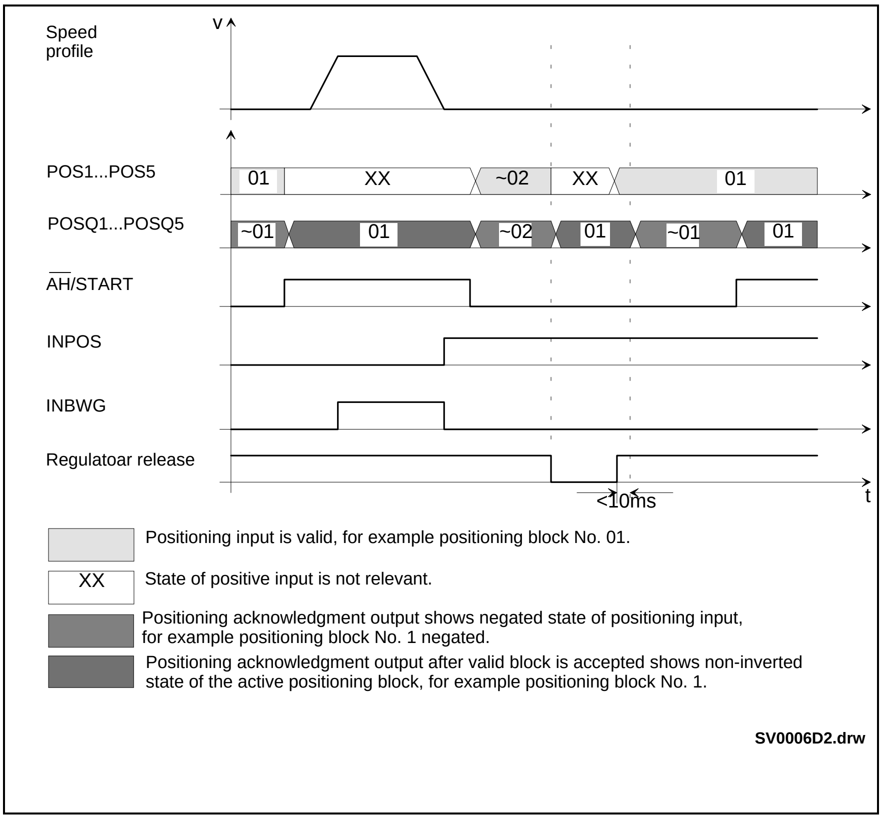


Fig. 5-43: Acknowledgement and „IN-POS“ after drive enable off

After activating the AH/start signal and accepting the new positioning block, time t < 14ms and then INPOS signal=0 appears until the new target position is reached.

Acknowledging control voltage interrupt

The last assumed positioning block is secured with control voltage off in parameter **P-0-4052, last assumed positioning block.** This means that after control voltage is switched back on, the last assumed positioning block is always generated.

Absolute encoder

If an absolute encoder is used, then it is possible to decide, after switching control voltage on and off, if the drive is still at the target position of the last assumed positioning block (INPOS message is active).

The INPOS message is fixed as soon as the drive is once again ready (bb contact closed).

Singleturn encoder

If a singleturn encoder is used, then the IN-POS message remains undefined after a break in the power until the first target position is approached or homing has been conducted.

Note: The INPOS message is retained if the axis is not moved during the interrupt. If the axis was moved into the positioning window, then the INPOS message will also be generated. After activating the drive enable, positioning block acknowledge changes, as described in "Acknowledgement with drive enable off".

5.7 Target position processing with modulo weighting

Modfulo function

With activated modulo function, all position data within the modulo range must be depicted

If the modulo function is activated, then all position data in the range **[0, modulo value 1]** are depicted. This means it is possible to implement infinitely moving axes with position data overrun.

The modulo value can be set via parameter **S-0-0103, modulo value.**

Activating the modulo function is done in parameter **S-0-0076, position data scaling type.**

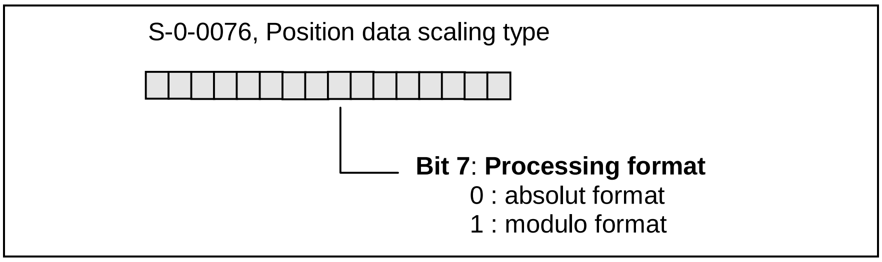


Fig. 5-44: Setting absolute format - modulo format

The modulo weighting of the position data artificially limits the range so that upon reaching the modulo value there is an overrun of the actual position value.

The difference in depiction of position data in absolute and modulo format is illustrated below:

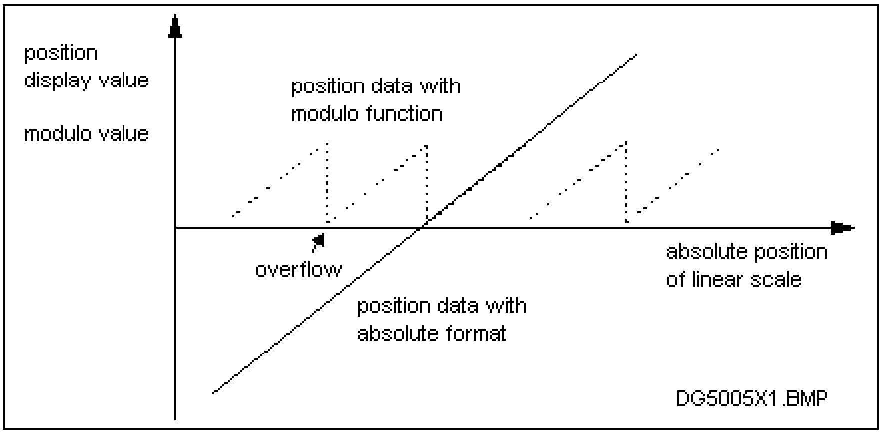


Fig. 5-45: Displaying the positions in absolute and modulo formats

Example 1:

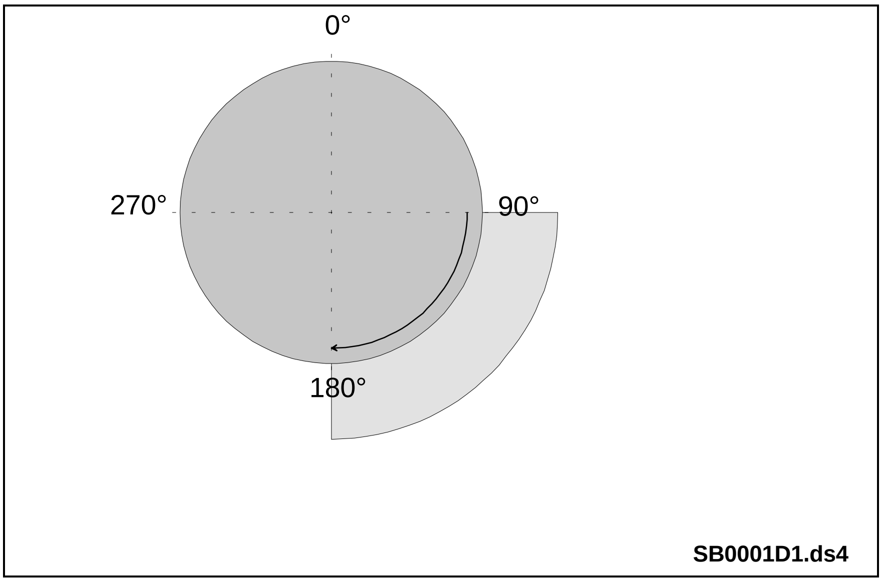


Fig. 5-46: Positioning with modulo scaling (positive direction)

Example 2:

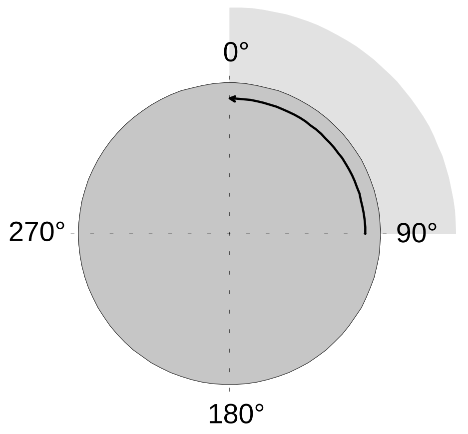


Fig. 5-47: Positioning with modulo scaling (negative direction)

If the absolute position command is activated with a desired position of 0° or a relative positioning command with desired position of 270°, then the drive moves 90° backwards.

Modulo processing - marginal conditions

If modulo processing is set for positioin data processing, then the following conditions, i.e.,

- the active operating mode and
- the position weighting set

marginal conditions must be maintained for position data processing to be error free. Whether the marginal conditions are maintained or not is checked in **S-0-0128, C2 communication phase 4 transition check** and the command, if necessary, if ended with error **C227 modulo range error.**

The marginal conditions for error-free processing of the modulo value are:

- The modulo range **S-0-0103, modulo value** may not exceed one-half of the maximum traversing range, which, in turn, is dependent on the motor encoder used.
- If rotary or translatory position weighting with load reference and no phase synchronization is used as operating modes, then the product of **S-0-0103, modulo value, S-0-0116, resolution of rotational feedback 1 and S-0-0121, input revolutions of load gear** must be smaller than 2^63.
- If rotary position weighting with load reference and angle synchronization are used as operating modes, then the product of **S-0-0237, Slave Drive Rotation I and S-0-0121, input revolutions of load gear** must be smaller than 2^63.
- If angle synchronization mode is used, then do not set translatory position weighting.

Modulo format processing of command values

How position command values such as **S-0-0047, position command value and S-0-0258 target position** are interpreted depends on the mode set.

The following possibilites exist:

- shortest path
- positive direction
- negative direction

Parameter **S-0-0393, command value mode in modulo format** exists for setting modes. This parameter only becomes effective if a modulo format was activated in **S-0-0076, position data scaling type.**

The following settings are possible:

S-0-0393:	Meaning:
0	shortest path
1	positive direction
2	negative direction

Fig. 5-1: Selecting a modulo format

Modulo mode "shortest path"

The next command value is reached over the shortest possible path. If the difference of two sequential commnd values exceeds one-half of the modulo value, then the drive runs in the command value in the direction set.

Modulo mode "positive direction"

The command value is always approached in a positive direction independent of whether the difference of two sequential command vaues is greater than one-half modulo value.

Modulo mode "negative direction"

The command value is always approached in a negative direction independent of whether the difference between two sequential command values exceeds one-half modulo value.

5.8 Positioning with limited speed

Function

When running with limit speed = **running slow**, it is posible to limit all **positioning runs** of the drive uniformly to one selectable maximum speed **S-0-0259, positioning velocity.** Operations that are generally slower anyway are not affected. (**Note** the differentiation with a proportional reduction by feedrate override).

The limit affects

- traversing with process bock
- jogging
- referencing/zero velocity
- synchronization processes (synchronization modes)

The limit is **immediately effective upon activation** even while running. The same applies to deactivation.

Applictions

The speed limit can be used

- during setup mode, test runs
- reduced speeds within a hazardous area

only together with other monitoring devices if:

WARNING

⇒ **The limited speed function alone does not offer sufficient personnel protection.**

Example

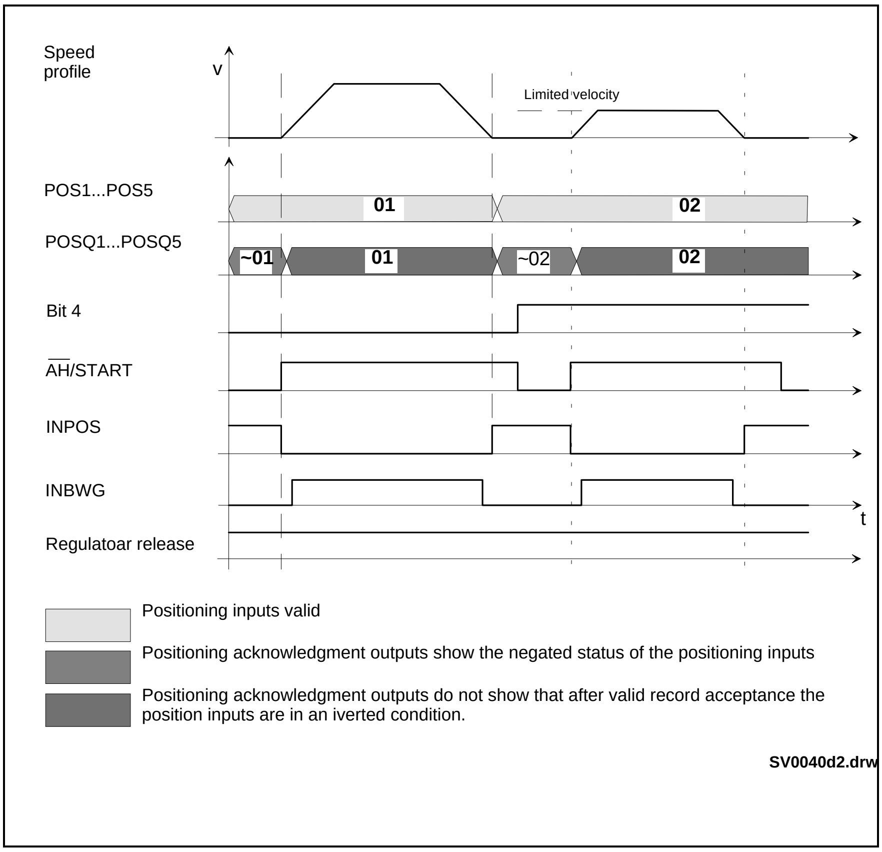


Fig. 5-48: Traversing without and with limited speed

The accel value remains the same. The run time becomes longer as the speed is reduced, acceleration times and paths are shorter, axes with the same traversing times at full speeds will reach the target positions at different times.

Parameters

The value to which the traversing speed is restricted **S-0-0259, positioning velocity.** This parameter is affected by the weighting of rotary and translatory speeds.

Activation

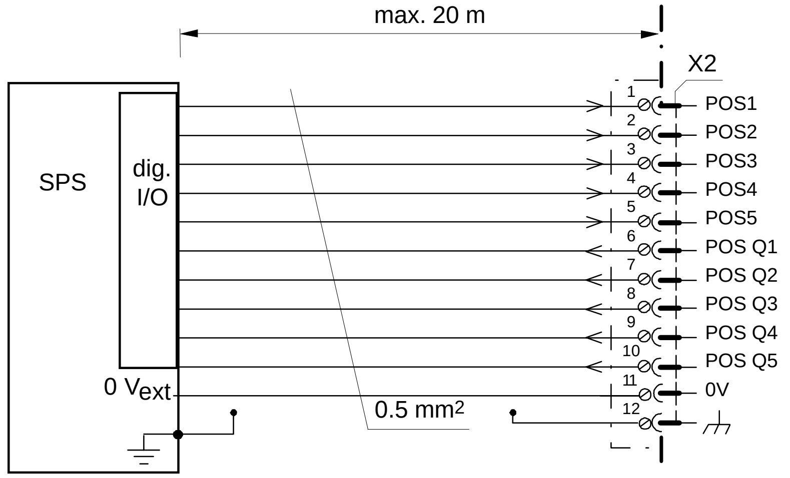
In **ECODRIVE,** traversing at limited speed is activated by setting bit 6 of the function parameter.

Bit 6 = 1 limited speed

Bit 6 = 0 full speed, as selected

The limit takes affect immediately. Even the speed of a linear positioning process will be limited.

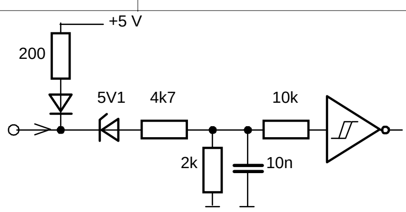
5.9 Positioning interface connections



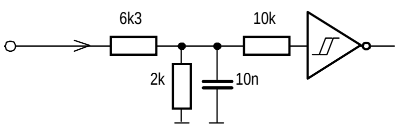
Inputs:

Input voltage	min.	max.
HIGH	16 V	30 V
LOW	-0.5 V	8 V
Input resistance	approx. 5 kOhm	

POS1
POS2
POS3
POS4



POS5



Outputs:

Output voltage	min.	max.
HIGH	16 V	$U_{ext.}$
LOW	0 V	1 V
Output current I_{out}	80 mA	
Leading time, fall time	approx. 5 µs	
Overload protection	at I_{out} > 300 mA the outputs switch to LOW	

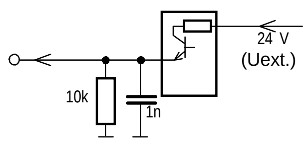


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Fig. 5-49: Positioning interface

POS1........POS5: Positioning command - selection inputs (binary coded)

POSQ1.....POSQ5: Positioning command - selection acknowledgements (binary coded)

6 DKC01.1 Drive Controller with Stepping Motor Interface

6.1 General Information on operations using a Stepping Motor Interface

The **ECODRIVE** acts as a conventional stepping motor drive controller in stepping motor interface operating mode. This enables conventional stepping motor controls to be attached to the **ECODRIVE**.

Note: Because the ECODRIVE digitally replicates a stepping motor drive, its use is not recommended for applications where precision is required. INDRAMAT has a line of excellent drive systems with SERCOS interfaces for applications such as this.

6.2 Setting Operation Mode: Position Control with Stepping Motor Interface

The operating mode with stepping motor interface is set via the controller / motor type / operating mode dialog.

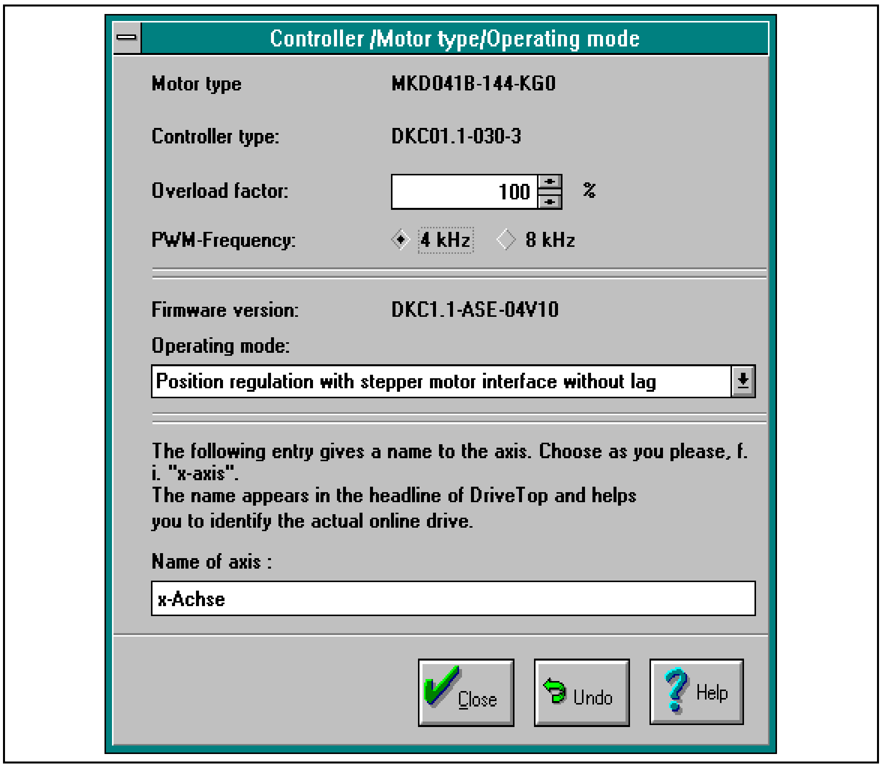


Fig. 6-1: Position Control with Stepping Motor Interface

Position Control with Following Error

When positioning in this mode, a speed dependent difference between the command position and the actual position will be created (Following Error). This synchronized action when positioning is dependent on the Kv-factor setting and causes a "creeping" towards the desired position, especially with small Kv-factors.

Position Control Without Following Error

In position control with following error mode, a speed control ensures that the command position and actual position are always the same. There is no speed dependent difference between command position and actual position.

Selecting the Appropriate Position Control Mode

As the drive controller simulates the behavior of an actual stepping motor in position control without following error mode, this mode should be given preference.

In less rigid mechanical systems, the acceleration knee points created by this mode cause undesireable mechanical vibrations. The position control with following error mode should nevertheless be used if the application allows this disadvantage.

Vibrations will then be dampened by reducing the Kv factor. Doing so creates a compromise between the positioning action and load rigidity.

6.3 Stepping Motor Signal Processing

In "Position Control with Stepping Motor Interface" mode, the DKC converts impulses from external inputs into defined position changes. The following modes can be selected:

- Quadrature signals
- Forward/backward signals
- Step and direction signals

The steps per revolution executed by the drive controller can be adjusted.

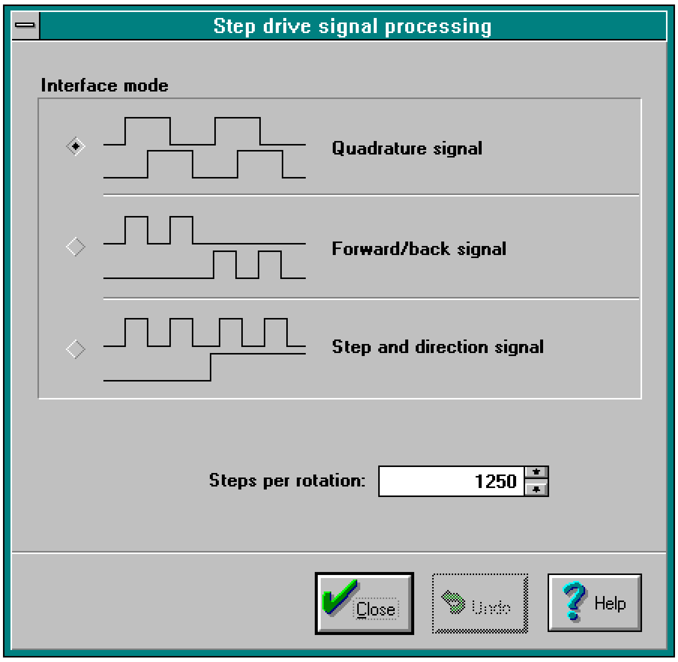


Fig. 6-2: Stepping Motor Signal Processing

Note: The DKC only processes the plses set if the drive enable and the AH/start signal have been applied and there is no drive error. In other words, fed impulses are lost if the drive is without drive enable signal or in "drive halt". The processed impulses are entered by position control without prior filtering. If the actual position value is in the positioning window, then the "INPOS" message is active.

6.4 Stepping Motor Interface

Interface Mode

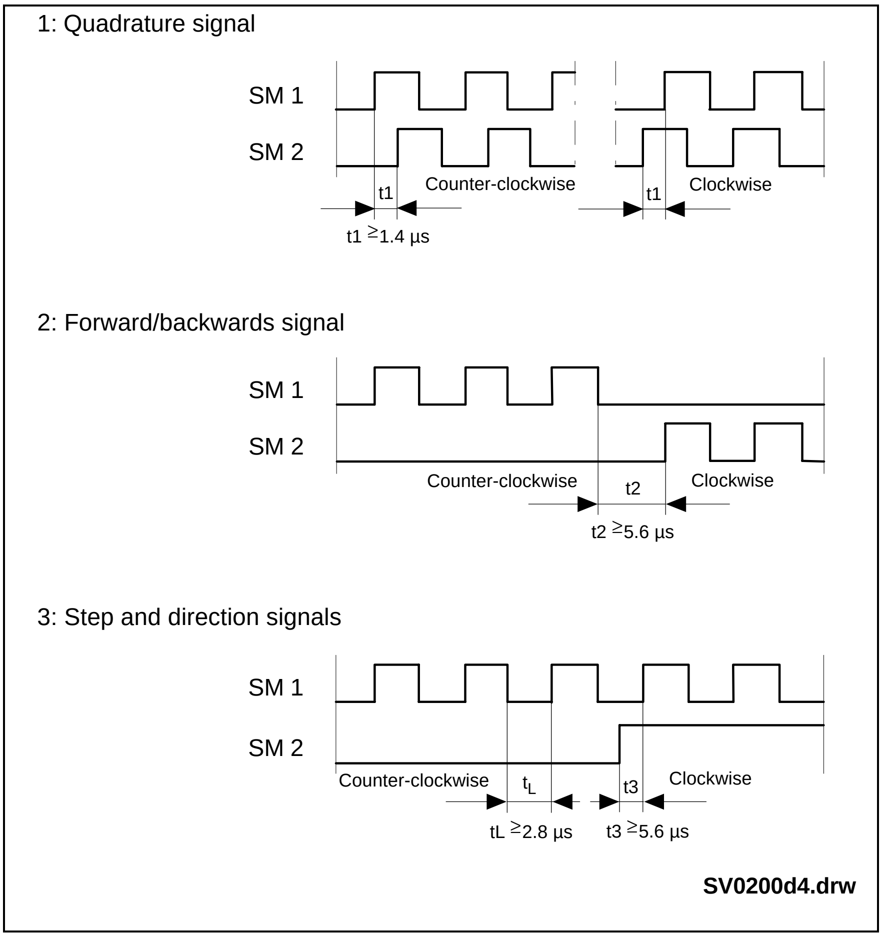


Figure 6-3: Stepping Motor Interface Mode

Stepping Motor Interface

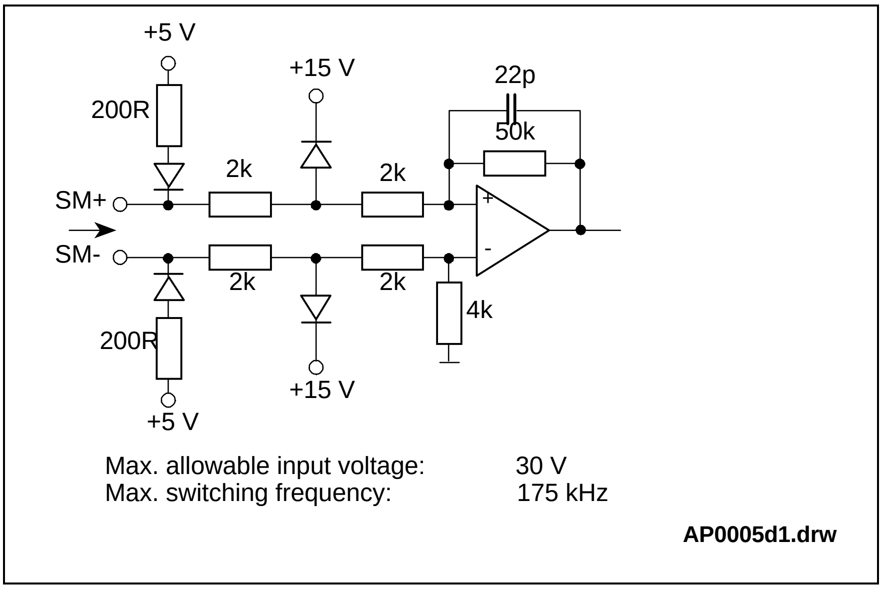
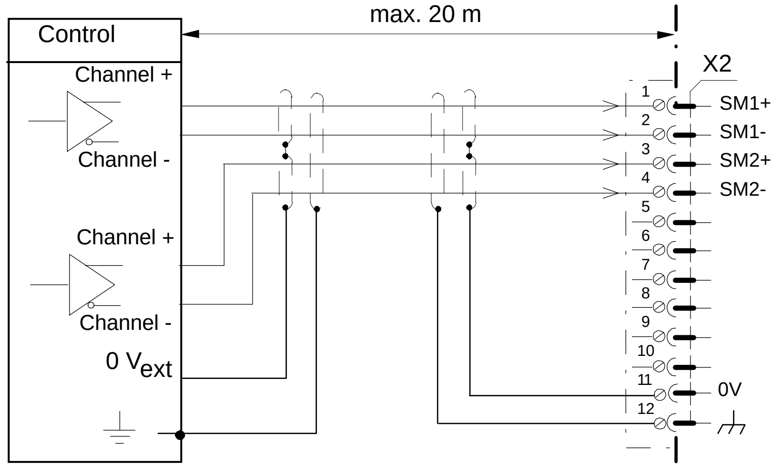


Fig. 6-4: Stepping Motor Interface

6.5 Types of Stepping Motor Signal Connections

Signals can be exchanged with the stepping motor control in two ways:

- Differential signals
- Open-collector signals



Inputs:

Input voltage	min. 0 V	max. 30 V
Clock frequency	max. 175 kHz	

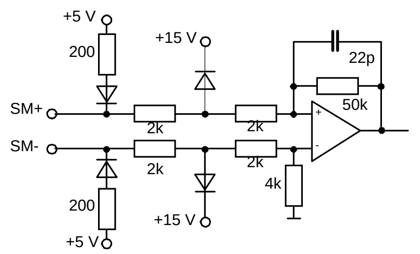


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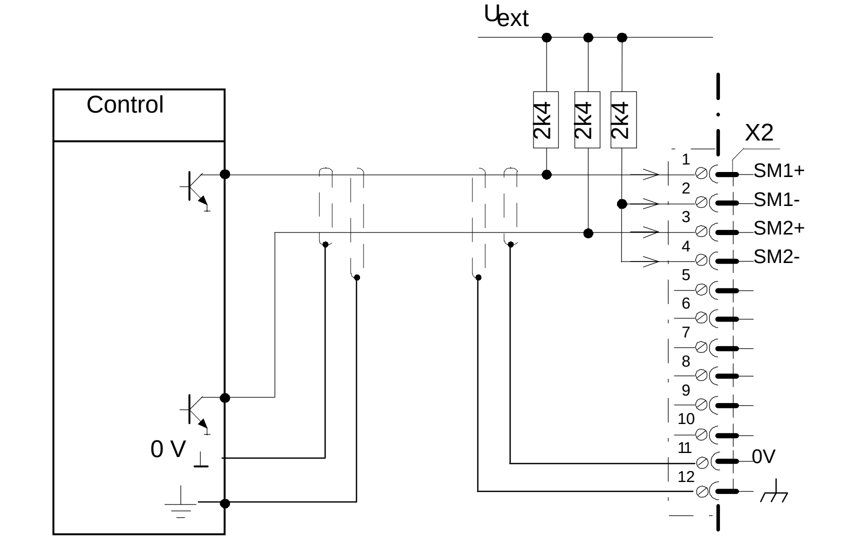
Fig. 6-5: Stepping Motor Transmission with Differential Signals



Inputs:

Input voltage	min. 0 V	max. 30 V
Clock frequency	max. 175 kHz	

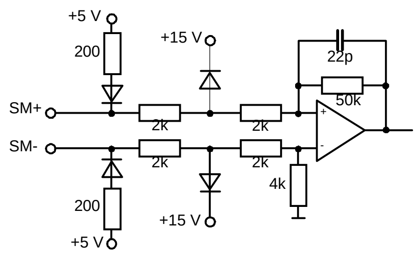


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Fig. 6-6: Stepping Motor Signal Transmission with Open-Collector Signals

Note: Transmitting the stepping motor signals as differential signals is recommended because the differential signals have a higher interference resistance.

7 DKC01.1 / DKC11.1 Drive Controller with Analog Speed Interface

7.1 General Notes on operations with an Analog Speed Interface

In "Speed Regulation with Analog Interface" mode, the **ECODRIVE** acts like a conventional analog servo drive. This makes it very easy to work with normal NC control systems.

Note: The digital signal processing in **ECODRIVE** might lead to interferences. It is therefore not recommended that **ECODRIVE** be used in precision applications. **INDRAMAT** has a line of excellent drive systems with **SERCOS** interfaces for applications of that type.

7.2 Setting Mode: Speed Regulation with Analog Interface

The "Speed Regulation with Analog Command Value" mode can be set through the controller / motor type / operating mode selection dialog box.

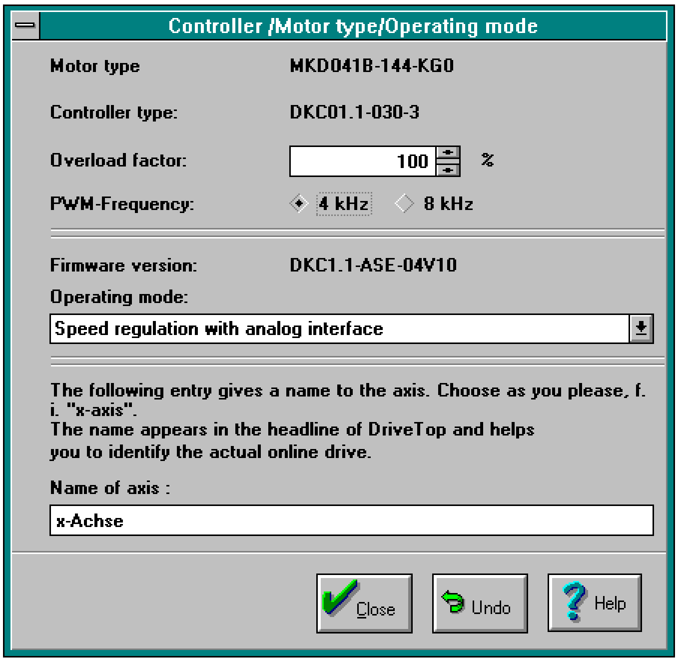


Fig. 7-1: Speed Regulation with Analog Command Value

7.3 Analog Speed Command Value Processing

The analog interface must be adapted to the connected NC control system. The command value scaling, the input offset, and the command value smoothing must be set to do this.

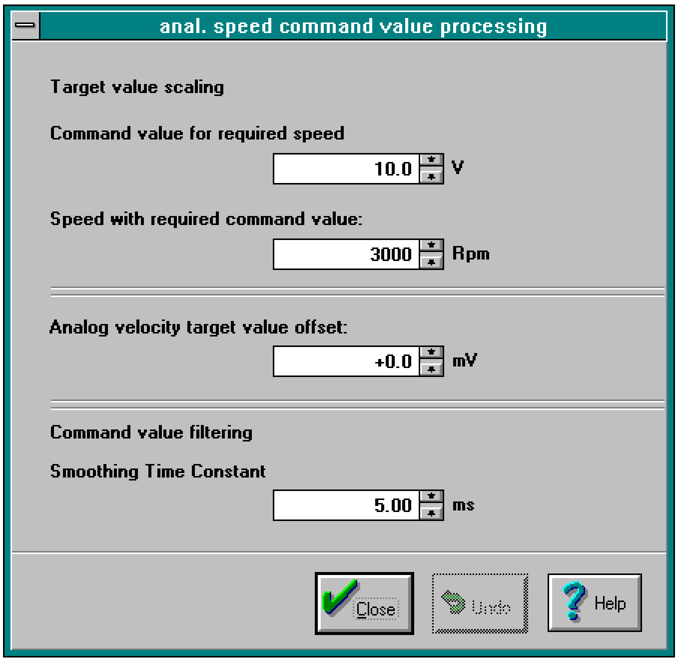


Fig. 7-2: Analog Speed Command Value Processing

Command Value Scaling

In order to scale the analog velocity command value, the maximum command voltage value must be entered in parameter "Command Value for Required Speed" at which a specific speed is to be achieved. The maximum speed is entered in parameter "Speed with Required Command Value".

The command and speed parameter values always refer to the motor shaft independent of the attached gears and the scaling setting.

Note: In the case of automatic control settings, the command value filter is preset with an eye towards good responses with command value changes in the control loop. It is necessary to correct this value upwards, in exceptional cases, given excessively long cycle times.

Offset Setting of the Analog Velocity Command Value

When the speed command value voltage is at 0V, the drive should be at a standstill. The "Analog Velocity Target Value Offset" parameter can be used to compensate for offsets in analog signal processing.

If the DKC together with the NC control system are being operated in position control, the offset setting can be used to adjust the static position deviation to zero. The axis in position monitoring should be used to do this. The offset parameter should be adjusted while the axis is at a standstill until the following error display for the NC control system displays the value zero.

Command Value Smoothing

Position loops in NC control systems work with a specific cycle time. Very often this cycle time is in the range from 5ms to 20ms. The velocity command values produced by the NC affect the drive controller like springs and cause vibrations and noises in the machine mechanics.

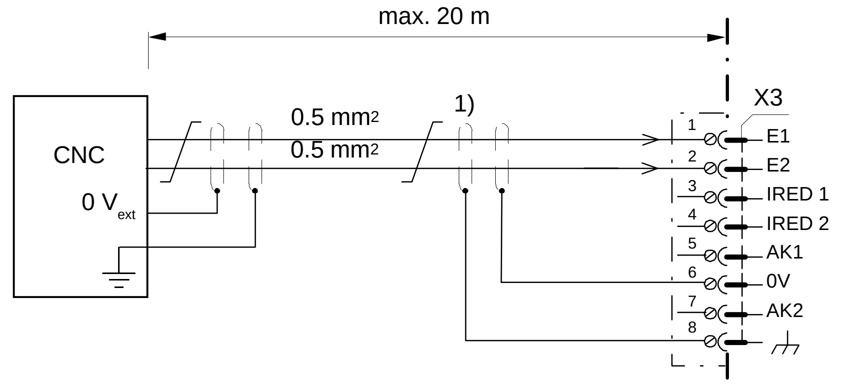
In order to reduce the vibrations, the command values can be filtered with command value smoothing.

The rule of thumb is:

$$\text{filter time constant} = 0.3 \ldots 0{,}5 \cdot \text{command value smoothing}$$

Fig. 7-3: Filter Time Constant for Command Value Smoothing

Analog Interface



Inputs:

Input voltage	min.	max.
between E1-E2	±10 V	±15 V
between E1-0VM; E2-0VM	±10 V	±15 V
Input current: E1; E2	0.5 mA	
Input resistance	approx. 20 kOhm	
Input drift	18 µV/°C	
AD converter	12 Bit	
Resolution per bit	4.8 mV	

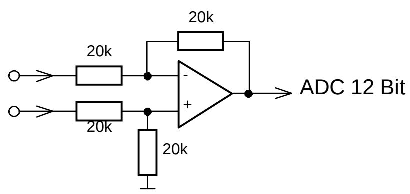


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Fig. 7-4: Connection Diagram of the Analog Speed Interface

Note

8 DKC01.1/DKC11.1 Drive Controller with Analog Torque Interface

8.1 General Instructions for Operation with Torque Interface

ECODRIVE can also be operated in torque regulation operating mode. The drive may have to generate a defined torque in special applications. Examples of this type of application are:

- Clamping of workpieces
- Master-slave operation for multiple axes

Note: **INDRAMAT** must be notified before **ECODRIVE** is used in this operating mode.

WARNING

Danger of accidents caused by uncontrolled axis movements!

If **ECODRIVE** is to be used as a torque regulated control drive, then protection mechanisms must be used to prevent people and machines from injury and damage!

⇒ Note: without external supervision the motor velocity during torque regulation can reach maximum velocity as a result of a very small command value setting, if there is no opposing torque in effect.

8.2 Setting the Operating Mode: Torque Regulation with an Analog Command Value

The "Torque Regulation with an Analog Command Value" operating mode can be set through the controller / motor type / operating mode selection dialog box.

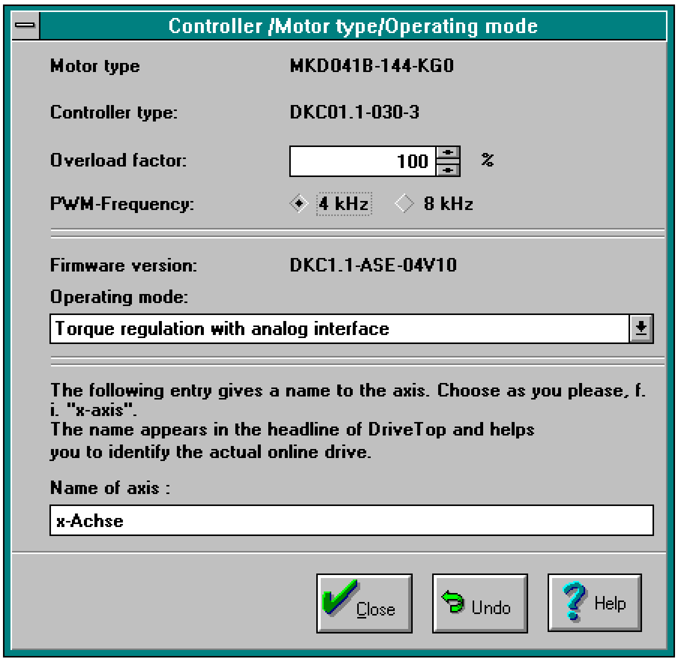


Fig. 8-1: Torque Regulation with an Analog Command Value

8.3 Analog Torque Command Value Processing

Scaling the Analog Torque Command Value

The following applies when scaling the analog torque command value:

The maximum effective peak torque is emitted when the input voltage is at 10V.

$$\boxed{\text{max. active peak torque} = P\text{-}0\text{-}4046 \cdot P\text{-}0\text{-}0051}$$

with P-0-4046, Active Peak Current

P-0-0051, Torque Constant

See also **P-0-4046, Active Peak Current**

Note: Only that value of P-0-4046 applies that is displayed in DTOP without torque limit. Any later reduction of the active peak current by limiting torque with the bipolar torque/force limit value S-0-0092 may effect the active peak torque displayed in DriveTop, but it does not effect the scaling of the analog torque command value!

Adjusting the Offset of the Analog Torque Input

In order to adapt the offset voltages to the analog command value transmission, an offset can be set in the drive controller.

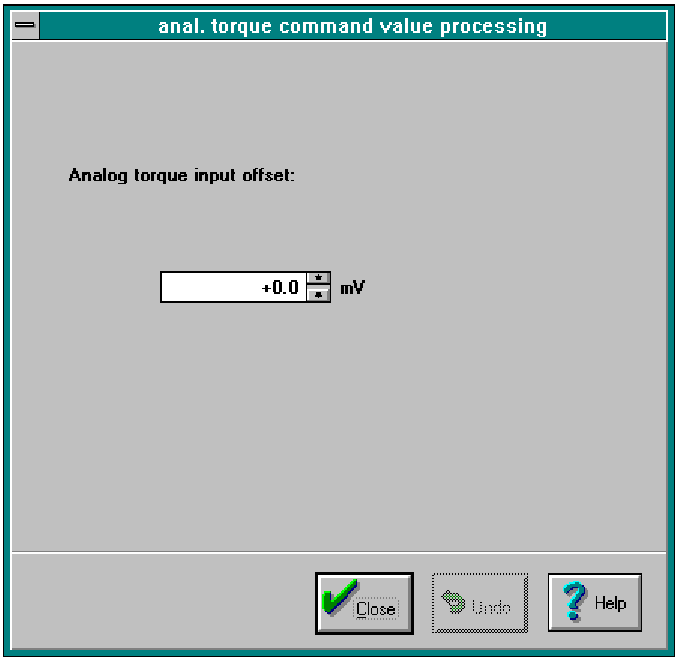
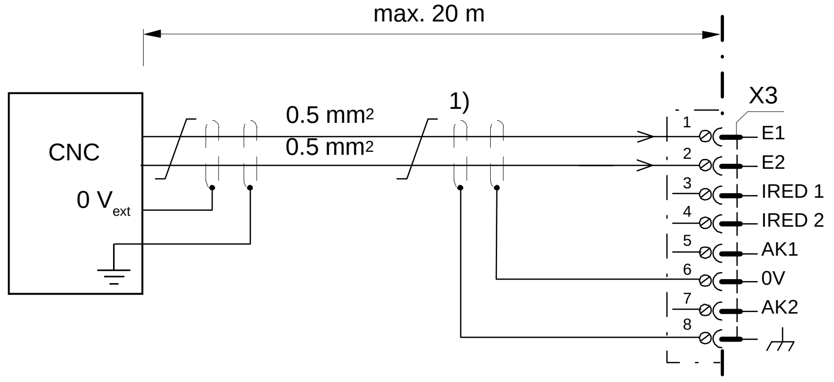


Fig. 8-2: Input Offset Adjustment in Torque Regulation

Analog Interface



Inputs:

Input voltage	min.	max.
between E1-E2	±10 V	±15 V
between E1-0VM; E2-0VM	±10 V	±15 V
Input current: E1; E2	0.5 mA	
Input resistance	approx. 20 kOhm	
Input drift	18 µV/°C	
AD converter	12 Bit	
Resolution per bit	4.8 mV	

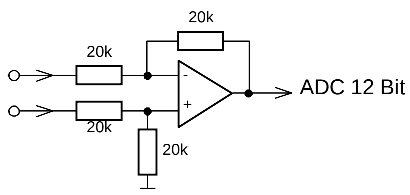


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Fig. 8-3: Connection Plan for the Analog Torque Interface

8.4 Velocity Supervision in Torque Regulation

When ECODRIVE is used in torque regulation, it supervises the velocity of the motor. If the current actual motor velocity exceeds the velocity limit value by more than 12.5% or a maximum of 100 rpms, the drive controller disengages the torque and displays the diagnostic **F879 velocity limit value exceeded (S-0-0092)**.

This feature can be used to prevent an undefined accelaration up to the motor's maximum velocity.

Note: The internal velocity supervision in torque regulation operating mode does not offer protection for personnel. External supervision devices and, if necessary, constructive precautions must be taken before personell protection and safety can be guaranteed.

9 DKC01.1/DKC11.1 with velocity and angle synchronization

9.1 Implementing an electronic gearbox

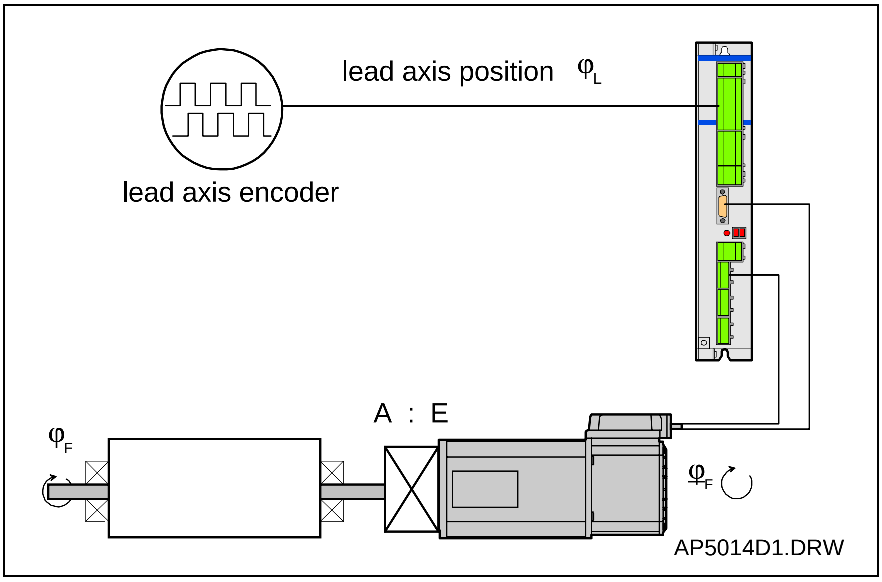


Fig. 9-1: Arranging an electronic gearbox

The variables depicted and implemented in the equations shown in Fig. 9-1 are defined as follows:

φ_L	master axis position	**P-0-0053**
φ_F	angle position of the following axis (load side)	
$\underline{\varphi}_F$	angle position of the following axis (motor side)	
E	mechanical gearbox input rotations	**S-0-0121**
A	mechanical gearbox output rotations	**S-0-0122**
φ_V	angle offset (as relates to the roller)	
f	electronic gearbox - adjustments	**P-0-0083**
n_L	master axis velocity (see φ_L)	
n_F	following axis velocity (load side, see φ_F)	
$\underline{n}_F$	following axis velocity (motor side, see $\underline{\varphi}_S$)	
n_V	additive velocity command value	**S-0-0037**

The indices have the following definition:

L	master axis
F	following axis
k	probe step k

Note: Variables that apply to the motor are underlined and variables that apply to the load are not underlined.

9.2 Generating the master axis position

The master axis position is gained by evaluating an incremental encoder with square-wave signals. This encoder evaluation processes the signals only relatively. No zero impulse is evaluated.

The master axis is evaluated only if a synchronization mode is activated.

The master axis position is stored in parameter P-0-0053.

The master axis position is depicted in degrees (360 degrees equals one master axis encoder rotation).

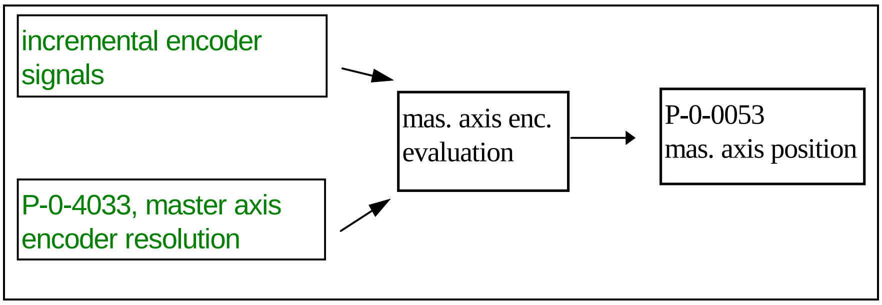


Fig. 9-2: Master axis encoder evaluation

Master axis encoder resolution P-0-4033

Parameter P-0-4033

The resolution of the master axis encoder (lines per rotation) can be set with parameter **P-0-4033, master axis encoder resolution.**

The master axis encoder must be connected to the step motor interface of the DKC.

Note: The master axis encoder can be either an incremental encoder or an ECODRIVE with incremental encoder emulation.

Block diagram of the master axis encoder on the DKC

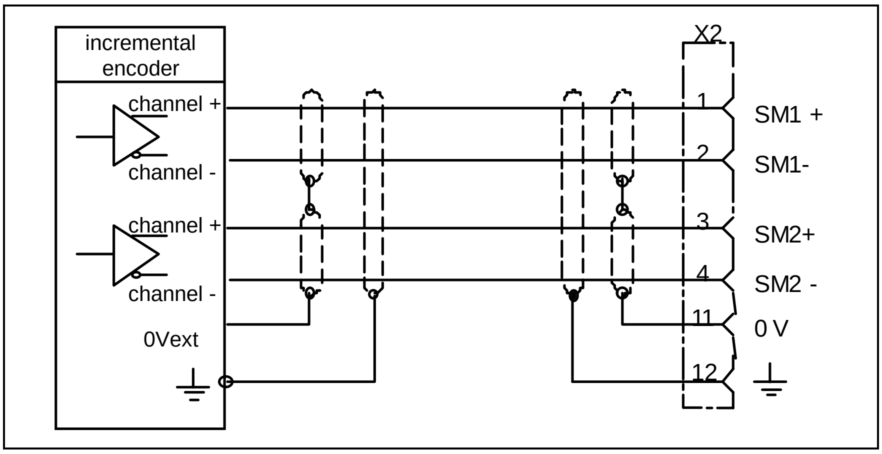


Fig. 9-3: Block diagram for master axis encoders

Note: Apply shields at both ends!

CAUTION

⇒ In both cases, the maximum input frequency (175 kHz) may not be exceeded.

Selecting the velocity command value filter

In the case of **very low encoder resolution** (e.g., 500 inc./rot.) resolution problems can occur with the internal command value processing of the **following axis.**

There is a velocity which can still be minimally evaluated

$$n_{Soll,Min} = \frac{2000}{\text{encoder resolution}} \cdot \frac{60}{\text{min}}$$

Fig. 9-4: Velocity

Numeric example:

Given an encoder resoluton of, for example, **500 inp. / rot.** at **minimum speed** results in **4 1/s or 240 1/min.**

Note: Due to the very nature of the system, this brings the user to the internal overflow limits of the velocity control with a very low master axis resolution. In extreme cases, with the velocity command value filter P-0-1222 off, the axis might not follow the command value.Therefore, a command value smoothing with a time constant of 2 ms is recommended.

Maximum permissible number of lines

In conjunction with operating modes

- velocity synchronization
- and angle synchronization

the incremental encoder emulation in the master drive is used to set a velocity command value for the following axis.

The maximum permissible signal frequency f_{max} at the step motor interface is a limit for the number of lines that can be emulated Z_I .

This numeric value is hardware dependent and equals about 175 kHz.

The maximum number of lines for the above referenced modes can be calculated as follows:

$$Z_I = \frac{60 \cdot f_{\max}}{n_{\max}}$$

L:	n_{max}	maximum permissible motor velocity
	f_{max}	maximum permissible signal frequency
	Z_I	incremental encoder line numbers P-0-0502 (with emulation)

Fig. 9-5: Maximum number of lines

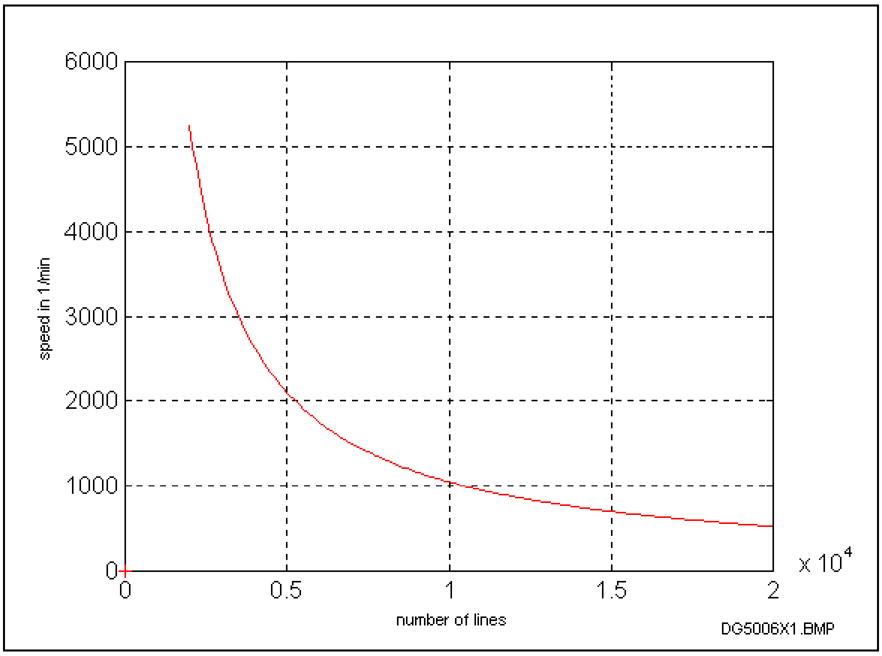


Fig. 9-6: Relationship of number of lines and maximum velocity

With a line number of 10,000, for example, the velocity to be emulated in the master axis, may not exceed 1000 1/min. so that no larger signal frequencies are gained f_{max}.

9.3 Velocity synchronization

In operating mode velocity synchronization there is a fixed velocity relationship between master and following axis. This velocity relationship is determined by the following variables:

- **P-0-4033, steps per revolution**
- **S-0-0236, lead drive 1 rotation**
- **S-0-0237, slave drive rotation 1**
- **S-0-0121, input revolutions of load gear**
- **S-0-0122, output revolutions of load gear**
- **P-0-0083, gear ratio adjustments**
- **S-0-0037, additive velocity command value**
- **P-0-1222, command value smoothing time constant**
- **P-0-0142, synchronization acceleration**

Setting operating mode: velocity synchronization, real master axis

Operating mode "Velocity synchronization, real master axis" is set via the dialog controller / motor type / select operating mode.

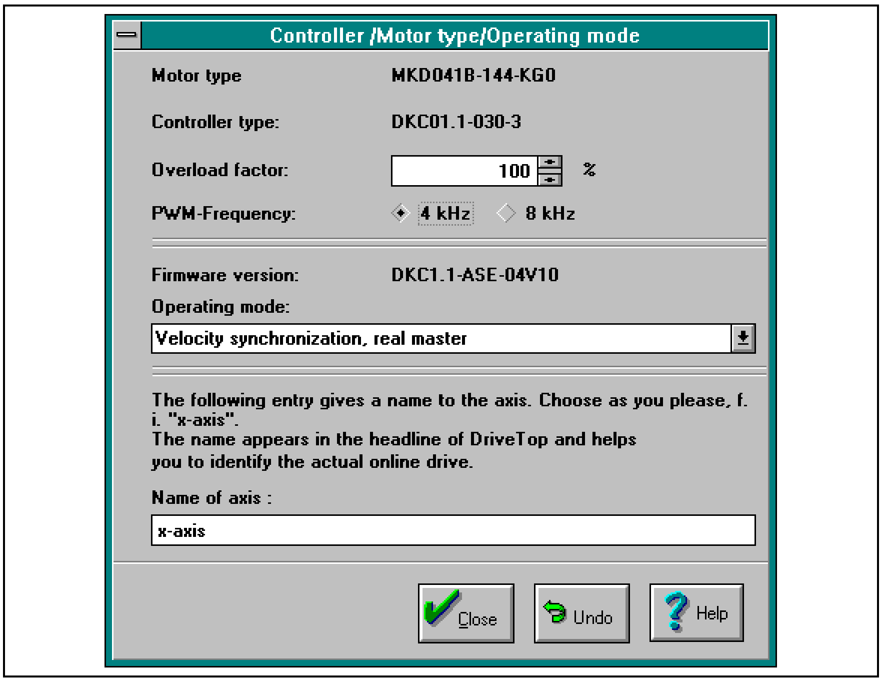


Fig. 9-7: Velocity synchronization, real master axis

The basic operating principle of velocity synchronization

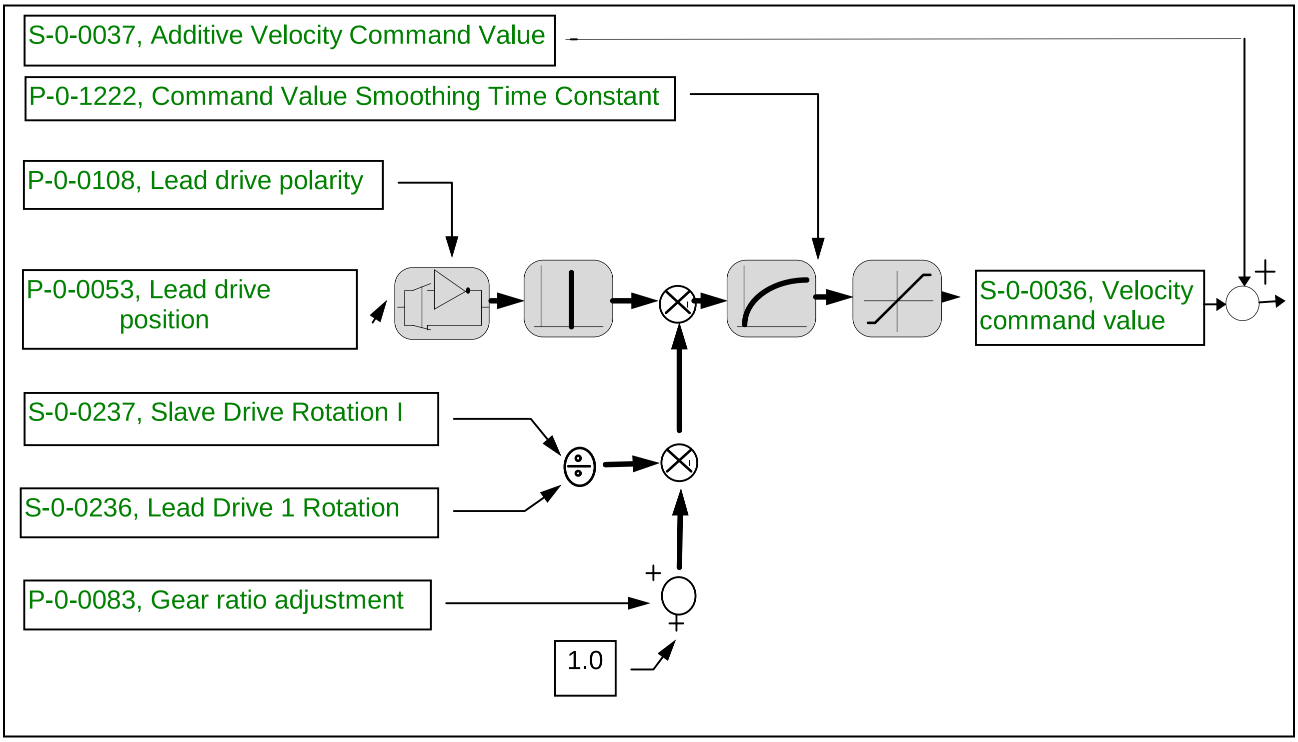


Fig. 9-8:Velocity synchronization diagram

Relationship of master axis to following axis velocity

Below depicts the relationship between master and following axis velocity.

$$nF = nL * \text{transmission ratio} * (1 + f) + nV$$

Legend: f gear adjustments

Fig. 9-9: Gear adjustments

The transmission ratio is as follows:

$$\text{transmission ratio} \; \frac{\text{following axis rotations}}{\text{master axis rotations}}$$

Fig. 9-10: Transmission ratio

The transmission ratio is set in parametrization mode. "Electronic gearbox - adjustment" is available for changing the transmission ratio during operation.

Setting velocity synchronization parameters

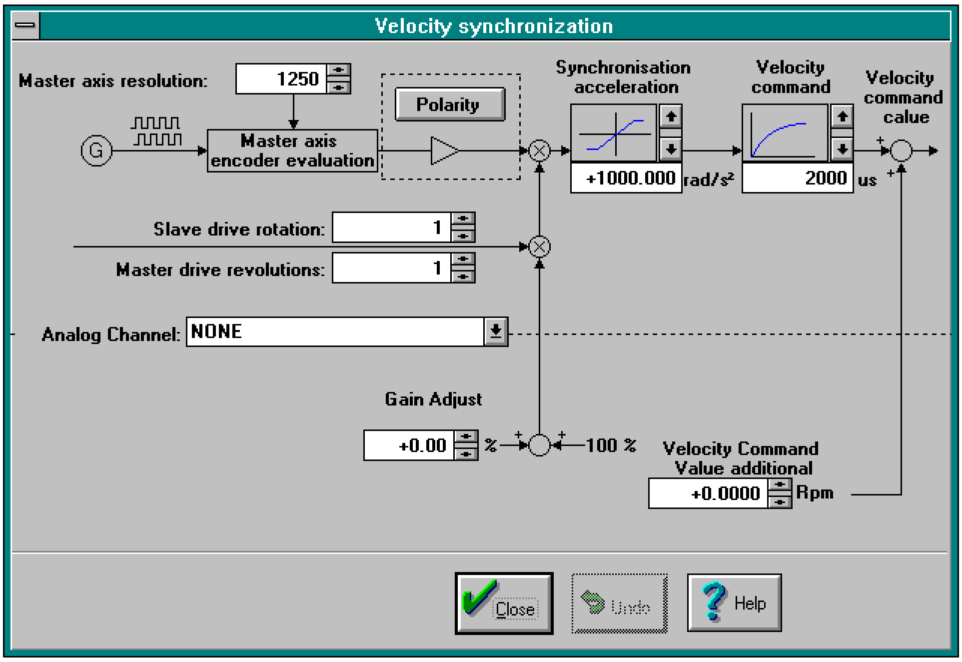


Fig. 9-11: Velocity synchronization

Gear adjustments via an analog input

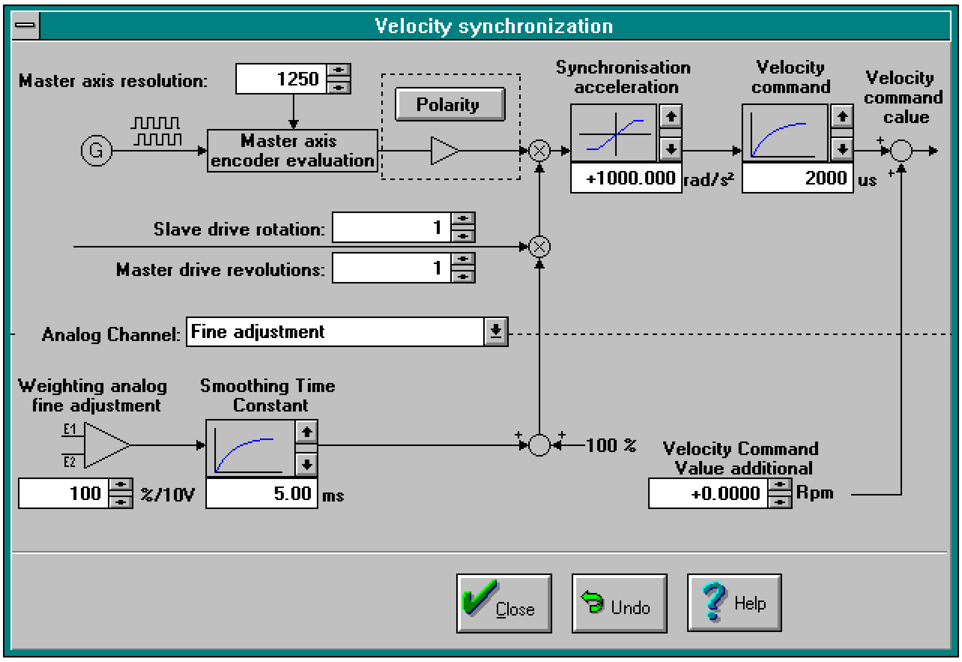


Fig. 9-12: Gear adjustments via an analog input

Gearbox transmission describes the per cent change of the transmission ratio.

For the DKC1, gearbox transmission adjustment can also be performed with the analog channel.

P-0-0152, Evaluating analog gearbox adjustment

Parameter P-0-0152

This parameter is used to set the analog channel evaluation for gearbox transmission adjustment. The evaluation can be set from 1%/10V to 327%/10V.

This parameter can only be set in parametrization mode.

Smoothing analog adjustment

Parameter P-0-0504

The analog signal for gearbox adjustment can be smoothed.

The time constant of the PT1 smoothing filter is set in parameter **P-0-0504, command filter smoothing time constant.**

Additive velocity command value

Using parameter **S-0-0037, additive velocity command value** it is possible to change the following axis velocity independent of the master axis velocity. The additive velocity command value can be set via the serial interface or the analog channel.

Additive velocity command value via an analog input

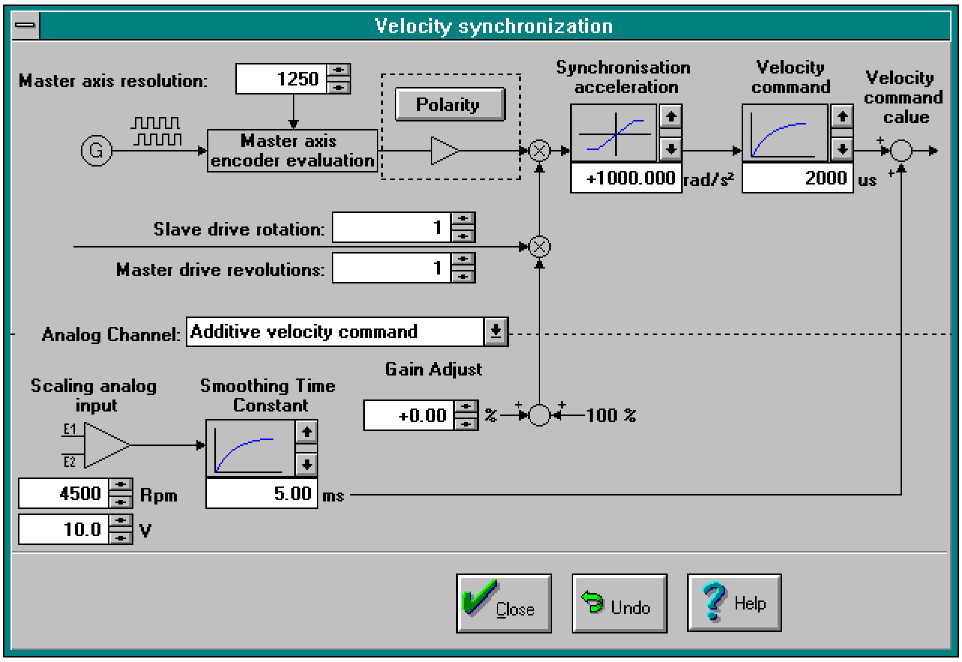


Fig. 9-13: Additive velocity command value via an analog input

The evaluation and smoothing of the analog signal takes place in the same way as with "velocity control with analog velocity command value".

Synchronization with velocity synchronization

Parameter P-0-0142

The following drive can synchronize from any initial state, taking **P-0-0142 synchronization acceleration** into acount, into a synchronous state. There is no jerk limit.

The drive works in speed control and generates speed command values.

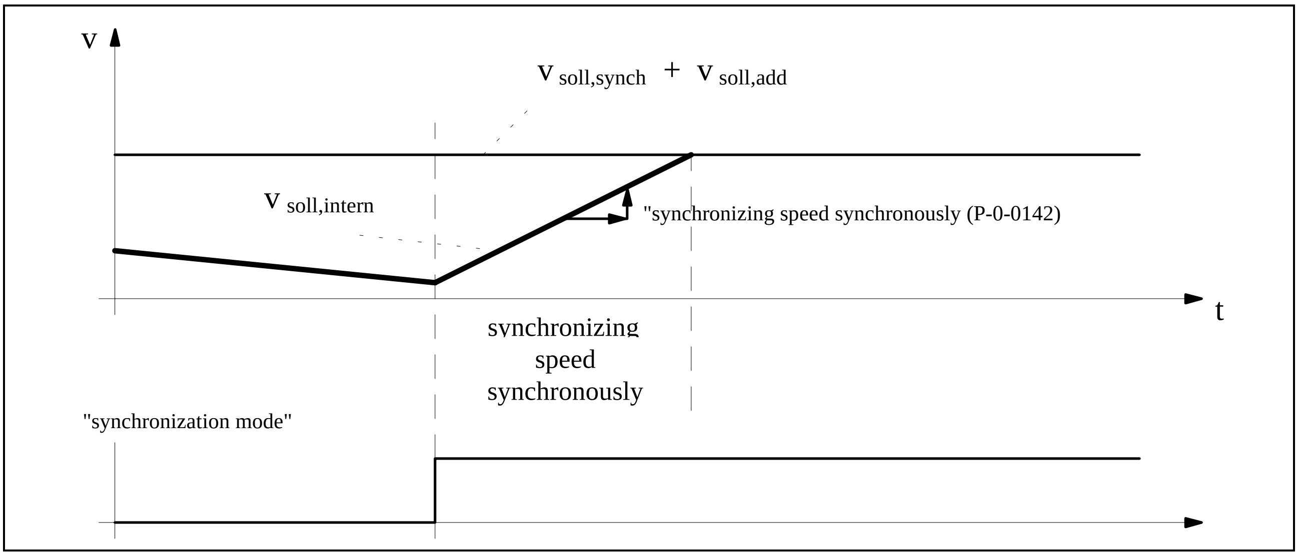


Fig. 9-14: Example of synchronizing with velocity synchronization

The example shows a drive currently braking, i.e., at the start of synchronization both the velocity and the acceleration of the following drive are not equal to 0.

At the start, command acceleration jumps to synchronization directly to the value set in parameter "synchronization acceleration“ (P-0-0142).

Synchronization is completed if the internally generated speed ($v_{soll,intern}$) is equal to the synchronous speed ($v_{soll,synch}$) + "speed command value - additive“ (S-0-0037, $v_{soll,add}$).

Check-back with speed synchronization

In speed synchronization mode, the check-back "In synchronization“ (in "manufacturer's C3D“ bit 8) is set if:

| $v_{soll,synch}$ + $v_{soll,add}$ - actual speed | < speed - synchronous running window)

Parameter S-0-0183

Parameter **S-0-0183, velocity synchronization window**

The output "IN-POS“ becomes active if the condition for synchronous running has been met.

9.4 Angle synchronization

There is a permanent angle relationship between master and following axes in angle synchronization mode. This relationship is defined in terms of the following variables:

- **P-0-4033, steps per revolution**
- **S-0-0236, lead drive 1 rotation**
- **S-0-0237, slave drive rotation 1**
- **S-0-0121, input revolutions of load gear**
- **S-0-0122, output revolutions of load gear**
- **P-0-0142, synchronization acceleration**
- **P-0-0143, synchronization velocity**
- **P-0-0151, synchronization init window for modulo format**
- **S-0-0048, additive position command value**
- The position data of the following axes must be in modulo format.

Setting anlg synchronization mode

Operating mode "Angle synchronization encoder 1, real master axis" is set via the dialog controller / motor type / select operating mode.

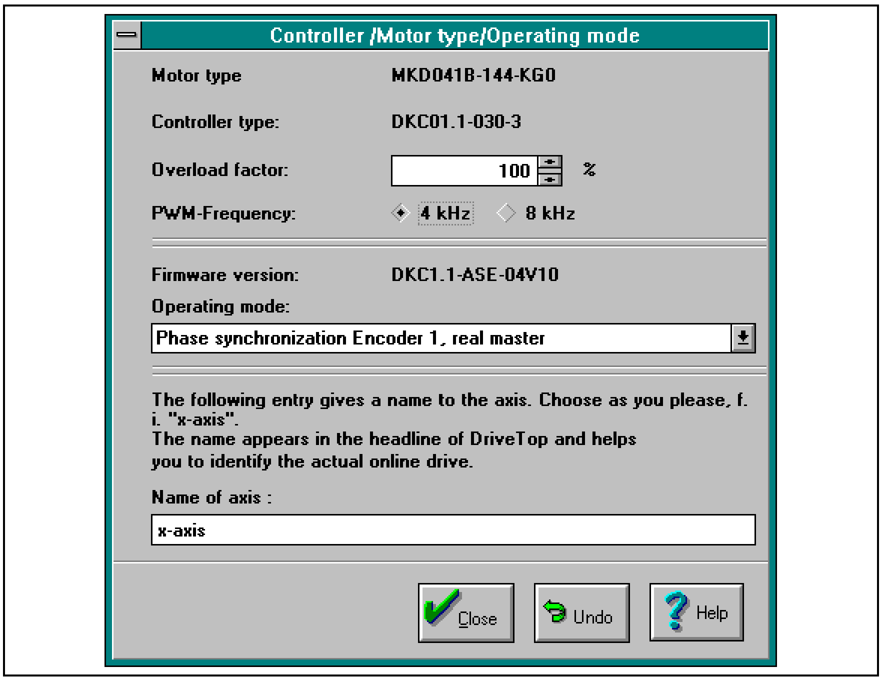


Fig. 9-15: Angle synchronization

Basic operating principle of angle synchronization

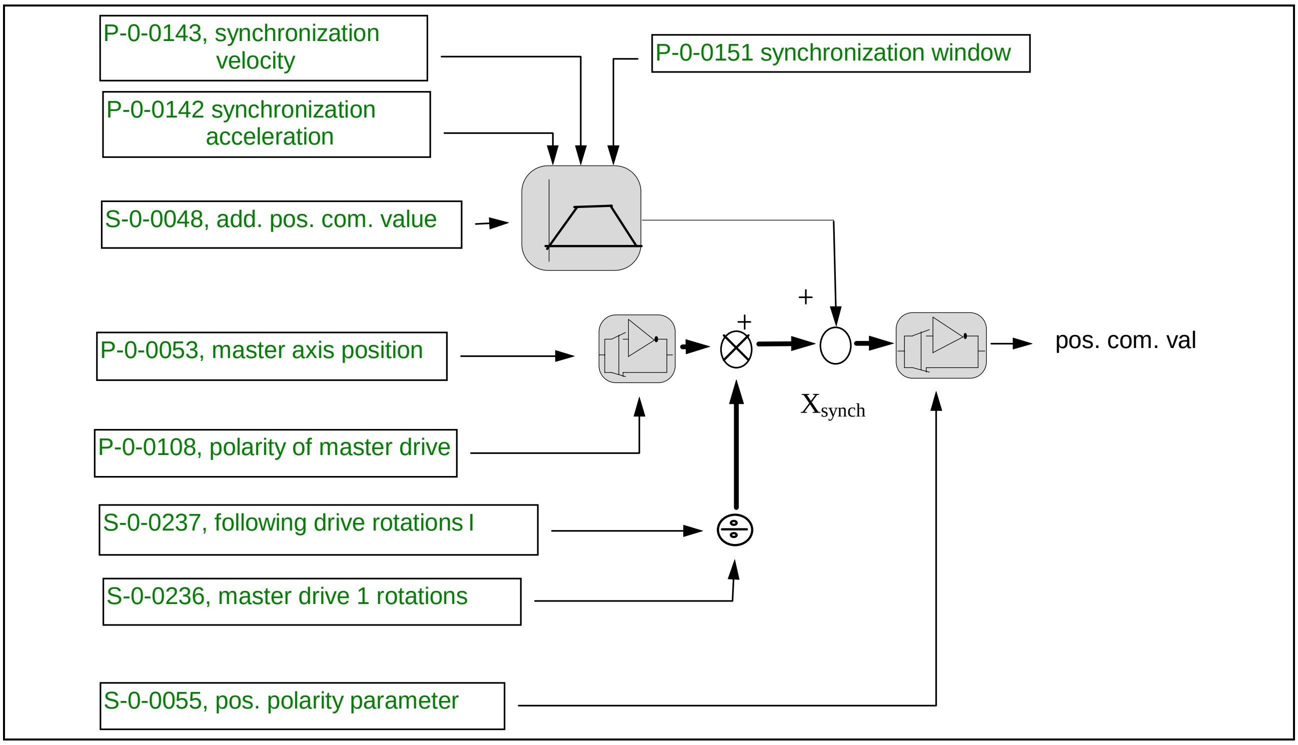


Fig. 9-16: Angle synchronization diagram

Relationship of master axis position - to following axis position

The angular relationship between master and following axis speed is described below:

$$\varphi F = \varphi L * \text{transmission ratio} * + \varphi V$$

Fig. 9-17: Angle synchronization

The transmission ratio is fixed as follows:

$$\text{transmission ratio} \; \frac{\text{following axis rotations}}{\text{master axis rotations}}$$

Fig. 9-18: Angle synchronization

The transmission ratio is set during the parametrization phase.

Setting angle synchronization parameters

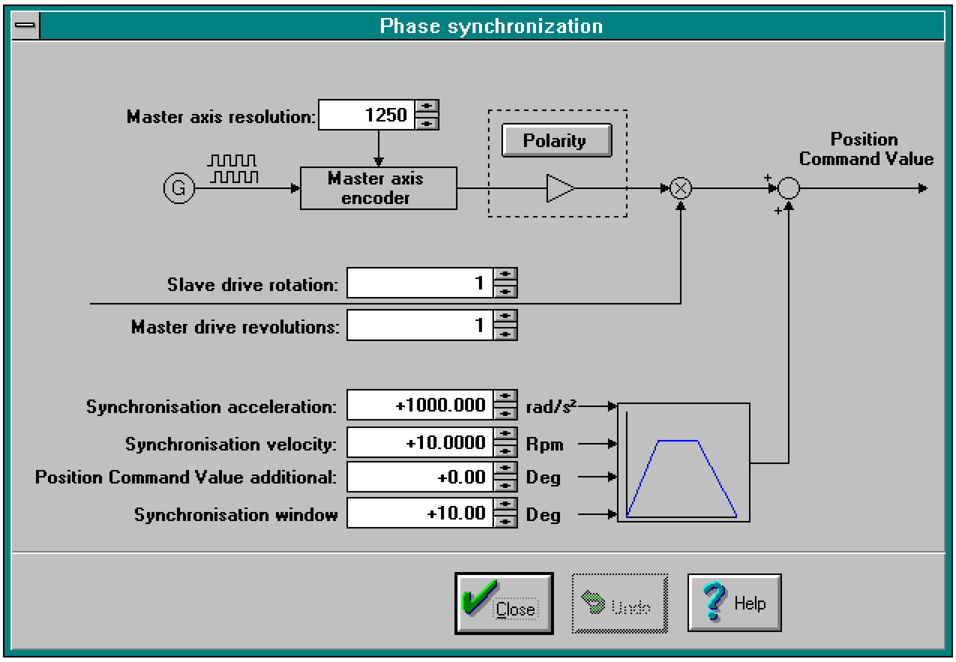


Fig. 9-19: Angle synchronization

Synchronization with angle synchronization

In this section, the behavior of the following drive when switching on angle synchronization is described.

The following drive can be synchronized into any synchronous state from any of the following initial states:

- $v_{\text{following drive}} \neq 0$
- $a_{\text{following drive}} \neq 0$
- $v_{\text{lead axis}} \neq 0$
- $a_{\text{lead axis}} \neq 0$

taking the following parameters into account

- **P-0-0142, synchronization acceleration**
- **P-0-0143, synchronization velocity**
- **P-0-0151, synchronization init window for modulo format**

The following illustrates an example of the steps during synchronization:

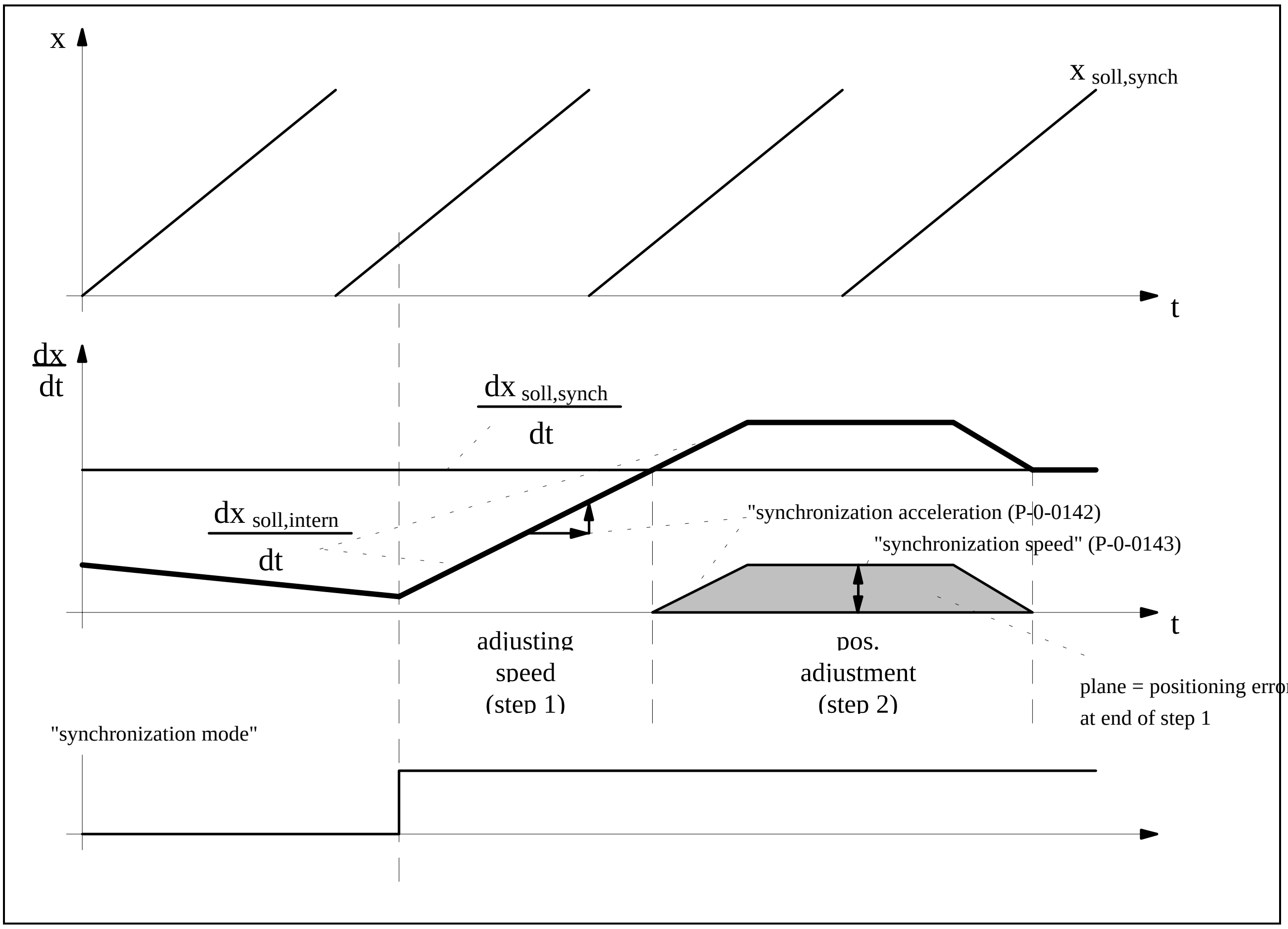


Fig. 9-20: Example of position adjustment during synchronization

This example illustrates a drive just braking, i.e., at the start of synchronization both speed and acceleration of the following drive are not equal to 0.

The command acceleration goes, at start of synchronization, directly to the value set in parameter **P-0-0142, syncrhonization acceleration**.

There is **no jerk limit.**

The first synchronization step has been concluded if the internally generated speed ($dx_{soll,intern}/dt$) is equal to the synchronous speed ($dx_{soll,synch}/dt$).

The plane under the ramp equals the positioning error after the first step is completed.

The second synchronization step is concluded if the internally generated position ($x_{soll,intern}$) is equal to the synchronous position ($x_{soll,synch}$) + "additive position command value“ (S-0-0048, $x_{soll,add}$).

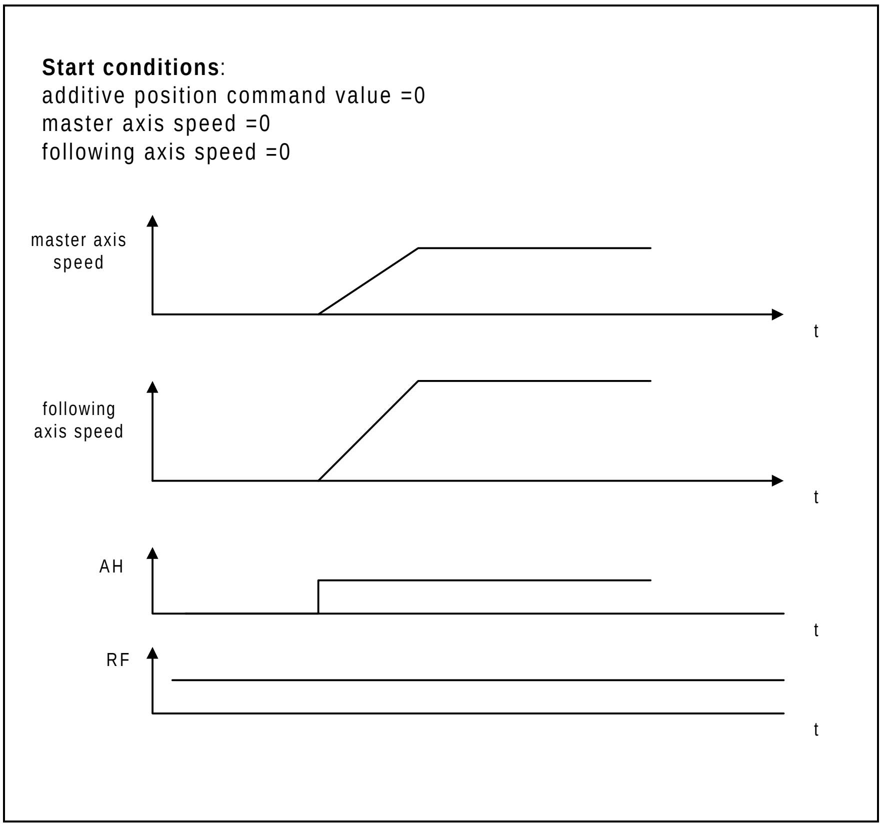


Fig. 9-21: A synchronization example

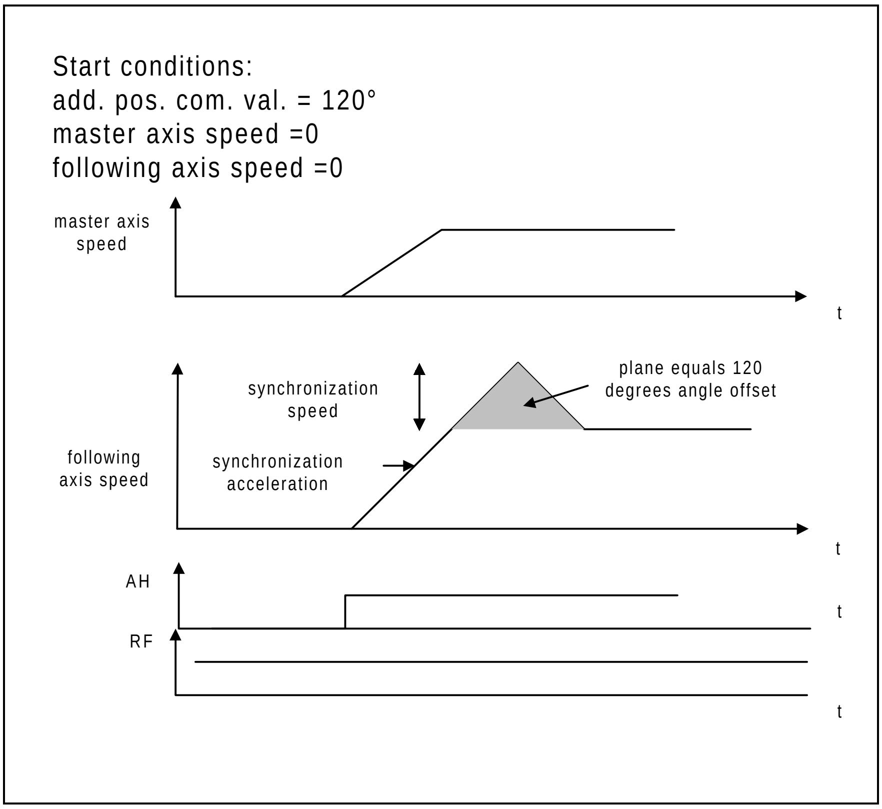


Fig. 9-22: Synchronization example no. 2

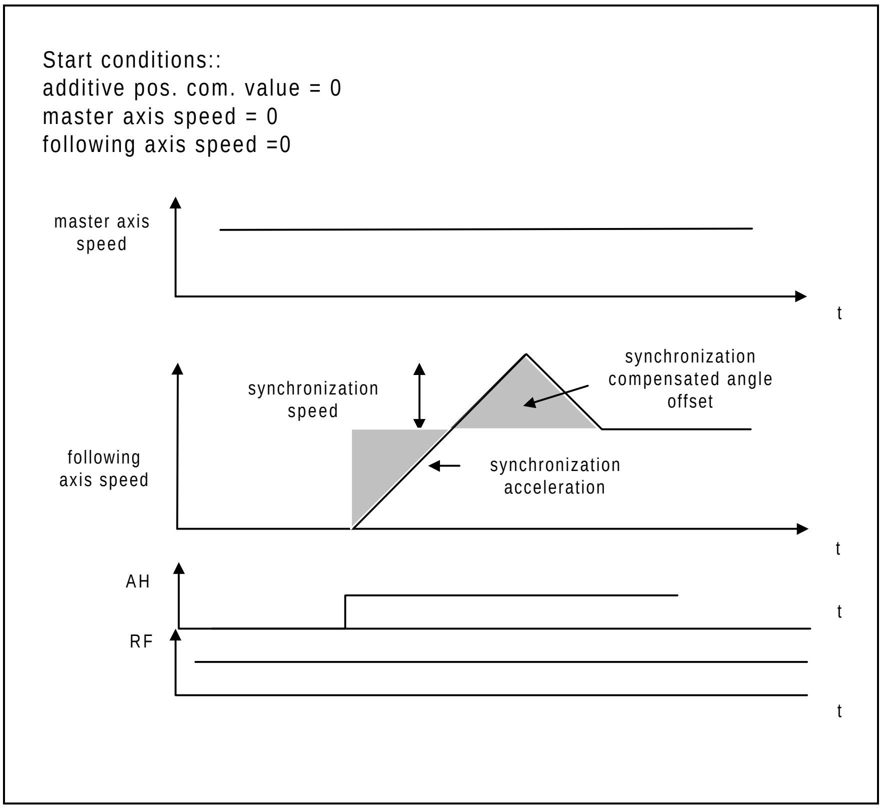


Fig. 9-23: Synchronization example no. 3

Synchronization direction

In parameter **P-0-0151, synchronization init window for modulo format** the position difference as it relates to the following drive is entered within which the rotation direction can deviate, during synchronization, from that set.

If the positioning difference is greater than the **synchronization window with modulo format (P-0-0151)**, then the direction of synchronization is set by parameter **P-0-0013, command value mode for modulo format**. If the positioning difference is smaller than this value, then synchronization could take place counter to the rotational direction set in parameter P-0-0013.

Generally, both master and following axes will be brought to a defined initial position (homing) and only then is synchronization started.

Check-back with angle synchronization

In angle synchronization mode, the following check-backs are set:

The following parameters are taken into account in this case:

S-0-0228, position synchronization window

The drive sets the bit „In synchronization“ (in **S-0-0182, manufacturer class 3 Diagnostics, bit 8**) in accordance with the following rule = 1, if:

| $x_{soll,synch}$ + $x_{soll,add}$ - actual position | < position synchronous running window

During step 1, speed adjustment during synchronization, this bit is always 0.

With the DKC1, output „IN-POS“ is set to 1 if the codition for „in synchronization“ has been met.

Notes

10 General Drive Functions

10.1 Scaling and Mechanical System Data

With **ECODRIVE** it is possible to process position, velocity, and acceleration data with respect to machine kinematics and mechanical transmission elements.

The Scaling/Mechanical System dialog in DriveTop provides all the settings which are necessary to allow machine mechanical systems to work with the drive controller.

Note: Entering the data is only necessary in "Position control with positioning interface" operating mode. Entering the scaling and mechanical system data is not mandatory in torque, velocity and position controls with step pulse interface operating modes because the adjustments prescribed by these parameters take place in the superordinate machine control. However, entering this data in operating mode can be advantageous as the DriveTop diagnostic window will show position and speed output variables scaled in units appropriate to the application.

Linear Scaling

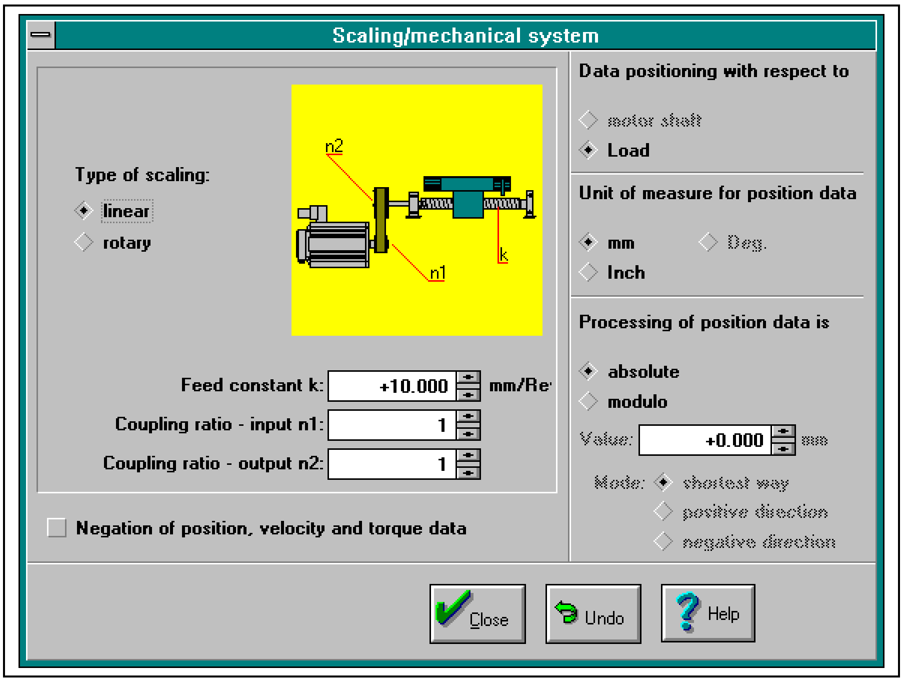


Fig. 10-1: : Scaling/mechanical system

In applications where a linear carriage is to be moved, all output variables of the shaft should be entered in linear units and recorded. Linear scaling should be selected and the mechanical data of the shaft entered. (Feed constant, transmission input revolutions, and transmission output revolutions, for example.)

A standard arrangement of a mechanical system with a circular rotary shaft is illustrated. Other similiar mechanical combinations can be derived from this standard configuration.

The feed constant for rack and pinion mechanism can be calculated as follows:

$$\text{Feed advance constant} = \text{effective diameter} \cdot \pi$$

Fig. 10-2: Calculation of the feed constant with a rack and pinion mechanism

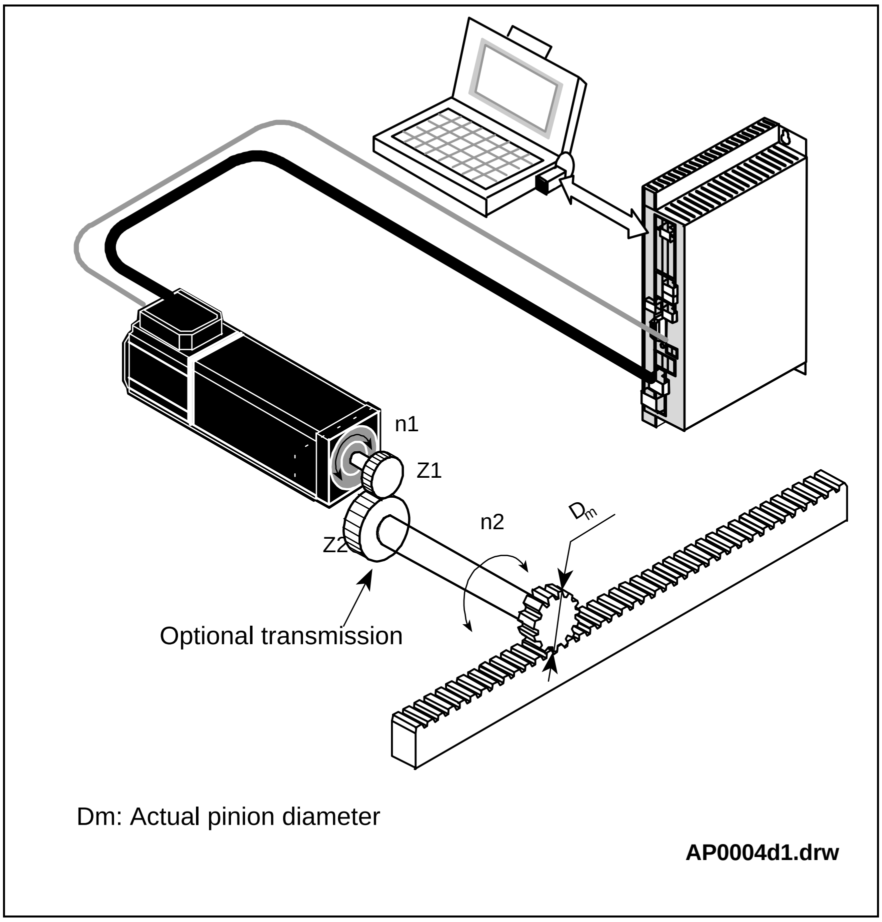


Fig. 10-3: Drive system with rack and pinion

The unit of the feed constant to be entered depends on the unit of measure which has been selected for the position data.

Data References

When using linear scaling,all output variables such as position, velocity, and acceleration are interpreted in terms of the load.

Units of Measure

When using linear scaling the unit of measure in which position, velocity and acceleration data will be displayed is selectable to be either inch or mm.

The feed constant should be entered in the unit per revolution that has previously been selected.

Example:

Unit of measure: mm

Unit for feed constant: mm/revolution

Negating Position, Velocity, and Torque Data

Position, velocity, and torque data can be negated in order to adapt the output variables to the logical direction of motion of an axis.

Negating this data has absolutely no effect in the control logic sense. Positive feedback in the velocity or position control loops cannot be caused by changing these polarities.

Note: To reverse the direction of motion in the torque control and velocity control modes, exchange the analog input signals (E1-E2).

ROTARY SCALING

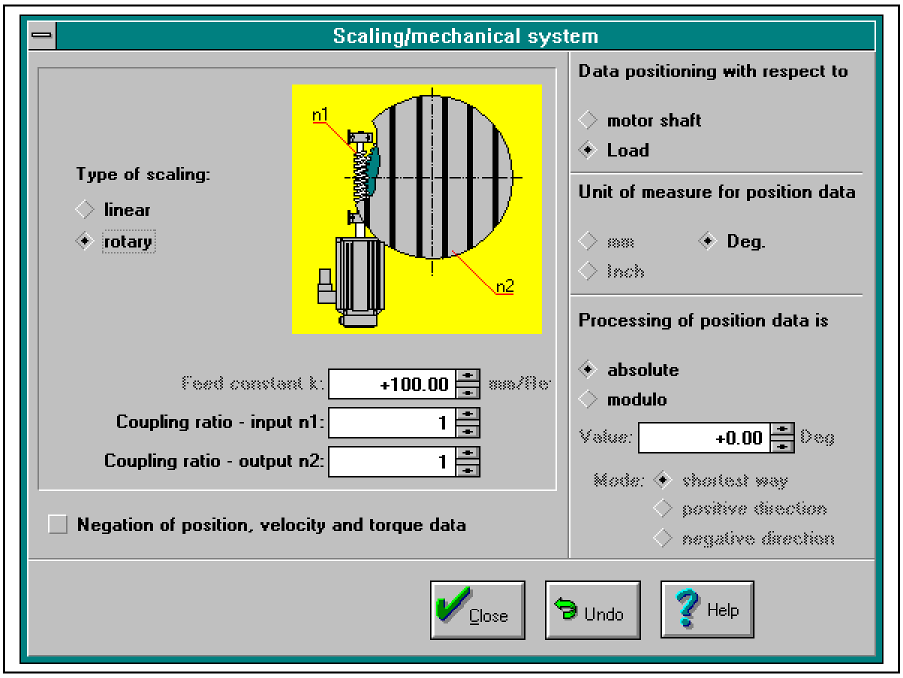


Fig. 10-4: Rotary Scaling

In applications where a rotary table or rotating shaft is to be driven, all output variables of the shaft should be entered in rotary units. To do this, select rotary scaling and enter the mechanical transmission data of the axis. (Coupling ratio input turns n1 and output turns n2) A standard arrangement for a typical mechanical system is shown in the Fig.. Other mechanical combinations (such as those with multi-leveled transmissions) can be derived from this standard arrangement. For example, a toothed gear or wheel transmission system can be conFig.d by counting the input wheel teeth Z1 and entering that value in the output turns n2 parameter, and counting the output wheel teeth Z2 and entering that value in the input turns n1 parameter.

Mechanical transmission ratio = n1/n2 = Z2/Z1

Data References

The position, velocity, and acceleration data which is displayed can be referenced to either the load side or the motor side in the rotary scaling mode. The load side is normally selected.

Processing Position Data

Position data can be processed in absolute or modulo format.

Absolute Format

Motion in one direction will show a continually ascending or a continually descending position value when processing in absolute format. In other words the position data is displayed as an absolute position over many revolutions of the motor or the load. It overflows at the end of the position data presentation range.

Maximum Presentation Range with Absolute Position Data Processing

The maximum presentation range with absolute position data processing is from - 5461 to + 5461 motor revolutions.

Modulo Format

Position data for shafts or rotary tables which move endlessly in one direction is normally processed in modulo format. This means that the position data overflows at a defined location (at the modulo value).

If modulo processing selected, a "modulo value" must be entered. The position data will then lie within this modulo range. The modulo value of a simple rotary table is normally set at 360°. This means that after one revolution of the round table the position counter will begin again at 0°.

Different modes of modulo processing can be selected:

See also section 5.7. **- target position processing with modulo weighting**

- **Shortest Path**
  The given target position is always approached via the shortest path. If the distance in a given direction between the actual position and the target position is larger than half of the modulo value, the drive will arrive at the target position from the opposite direction.

- **Positive Direction**
  The given target position is always approached in a positive direction.

- **Negative Direction**
  The given target position is always approached in a negative direction.

Boundary Conditions for Modulo Processing

Several boundary conditions, which are checked in the general parameter test which occurs when switching from parameter mode into operating mode, must be met for proper modulo processing. If necessary, violations of these requirements are displayed with the diagnosis:**C227 Modulo Range Error**.

- The contents of the **S-0-0103 Modulo Value** parameter may not be larger than half of the maximum travel range. The maximum travel range refers to the 4096 motor shaft revolutions.
- The product of S-0-0103 Modulo Value * 4 and **S-0-0121 Input revolutions of load gear** must be smaller than 2^63 with rotary scaling and position data referenced at the load.

10.2 Drive limits

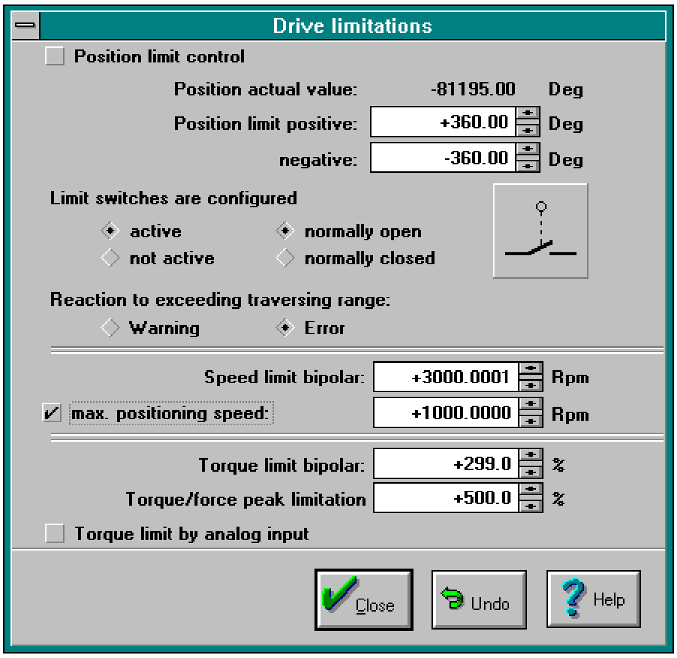


Fig. 10-5: Drive limits

Transverse range limits

ECODRIVE provides two internal methods to monitor the travel range of an axis:

- Travel limit switches
- Position limits

A travel region is exceeded when a directional travel limit switch is activated or when a position feedback value referenced to the machine zero point exceeds one of the position limit values.

Activation and Parameters for Position Limit Monitoring

The drive must be homed before the position limit can be monitored.

The position limit monitor can be either activated or deactivated. In particular, the position limit monitor must be deactivated in applications with continually rotating shafts.

The positive and negative position limit values can be independently entered. To assist with setup, the current position feedback value is displayed.

Note: Reference is lost with singleturn encoders as soon as a phase is changed!

Activation and Parameterization of Travel Limit Switches

Travel limit switches are available to limit the travel range. These limit switches can be activated and deactivated. The logic of the of the limit switch operation can be selected when actively using the limit switches. (Limit switch inputs may be conFig.d to be either active high or active low.)

Connecting the Travel Limit Switch

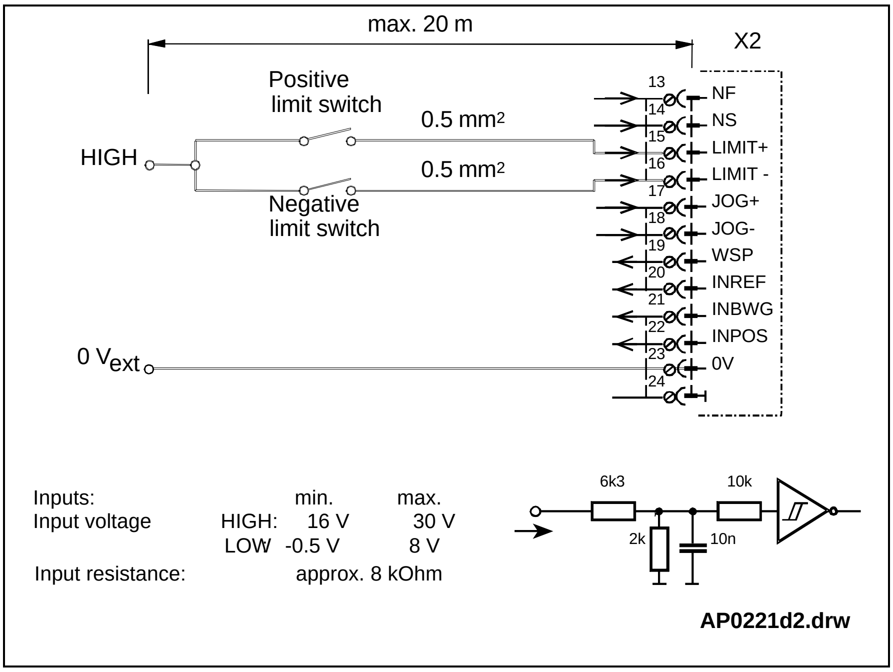


Fig. 10-6: Connecting the travel limit switches

Reaction to Traverse Range Violations

The drive has several responses to going beyond the traverse range. The following responses can be selected:

Traverse Range Violation as a Warning Response

The drive reacts to going beyond the traverse range by switching the velocity command value to zero without turning off the control enable and without opening the bb-contact. The warning is automatically recalled when command values are given which lead to the proper traversing range.

Traversing Range Violations as an Error Response

The drive reacts to going beyond the traverse range by switching the velocity command value to zero, automatically turning off the controller enable, and opening the bb-contact. To resume operation, clear the error, turn on the mains power supply, and enable the controller again. As long as the traverse range is exceeded, only command values which lead back into the proper tradverse range will be accepted. Command values outside of this range result in another error.

Limiting Velocity

The maximum velocity to be reached by the drive can be set via the bipolar velocity limit value parameter. If the requested velocity is greater than this limit, the drive will automatically contain the velocity at the limit value.

See also section 5.8 - **positioning with limited speed**

Limiting Velocity in Torque Regulation Mode

In the torque regulation mode the velocity is monitored at 1.125 times the value of the given limit. If this value is exceeded, the drive switches to a torque free state. If the motor has a brake it will be applied. The following error message will be given:

- **F879 Velocity Limit Value Exceeded (S-0-0092)**

Torque Limits

In order to protect the components of the machine, it may be necessary to reduce the maximum torque of the drive. There are two ways to do this:

- Permanently limiting torque via parameters
- Variable limits via an analog torque reduction input

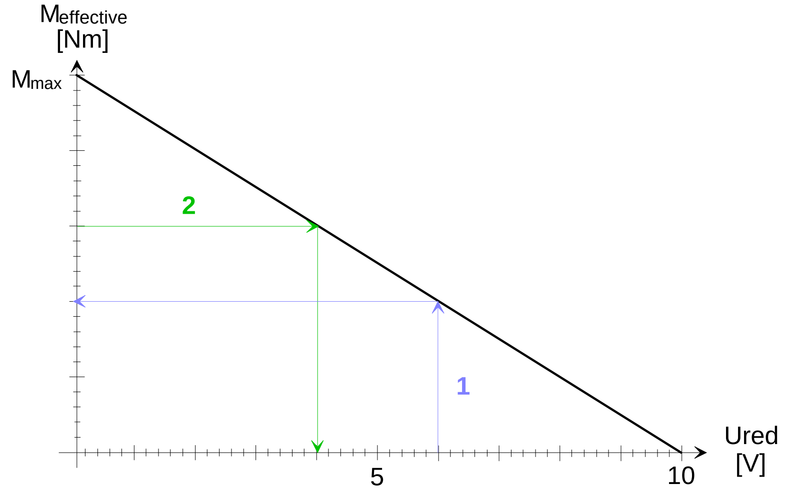
Limiting Torque via Parameter

The maximum torque to be produced by the control drive can be set via the **S-0-0092, Bipolar Torque/Force Limit Value** parameter. This value is to be entered proportionally. One hundred percent corresponds to the torque produced by the motor in the use at a standstill.

If processing blocks are started that are not possible with the physical limits set, then anticipate the generation of error **F228, Excessive Deviation.**

Limiting Torque Via Analog Input

The effective peak torque can be continuously reduced via the analog torque reduction input.



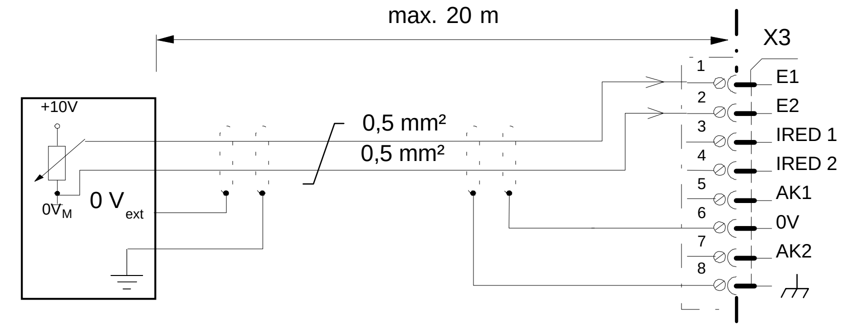
Mmax: bipolar limit value
Meffective: torque to be reducet to
Ured: voltage between IRED1 and IRED2

1 determine effective M (in % of Mmax) with Ured

2 determine Ured with effective M (in % of Mmax)

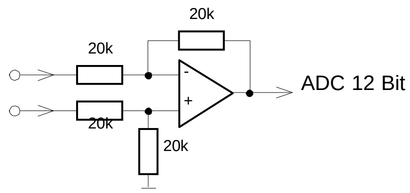
DG0001d2.drw

Fig. 10-7:Diagram for determining torque reduction



Inputs:

Inputs voltage	min.	max.
between IRED1-IRED2	±10 V	±15 V
between IRED1-0V; IRED2-0V	±10 V	±15 V
Input current: E1; E2	0,5 mA	
Input resistance	approx. 20 kOhm	
Input drift	18 µV/°C	
AD-converter	12 Bit	
Resolution per bit	4,8 mV	



AP0214d2.drw

Fig. 10-8:Connecting the analog torque reduction

10.3 Monitoring functions and error reactions

Many functions are monitored in connection with operating modes and parameter settings of the drive.

Monitoring functions

Note: All monitoring functions are described in detail in the Diagnostics Description!

Encoder monitor

Absolute encoder monitoring

- F276 Absolute Encoder Error

Motor encoder monitoring

- F229 Motor encoder error: quadrature error
- F822 Motor encoder failure: signals too small

Voltage monitoring

DC-24V voltage

- F870 24 V error
- F248 low battery voltage

Power section

- F226 undervoltage error

Temperature monitor

Motor temperature

- F219 motor overtemperature shutdown
- E251 motor overtemperature warning

Amplifier temperature

- F218 heatsink overtemperature shutdown
- E250 heatsink temperature warning

Bleeder monitoring

- F220 bleeder overtemperature shutdown
- E252 bleeder overtemperature warning

Control loop monitoring

Speed control loop monitoring

- F878 velocity loop error

Position control loop monitoring

- F228 Excessive deviation

10.4 Error Handling

If a condition is recognized which will not allow proper functioning of the drive, an error message is generated and the drive will automatically respond to the error.

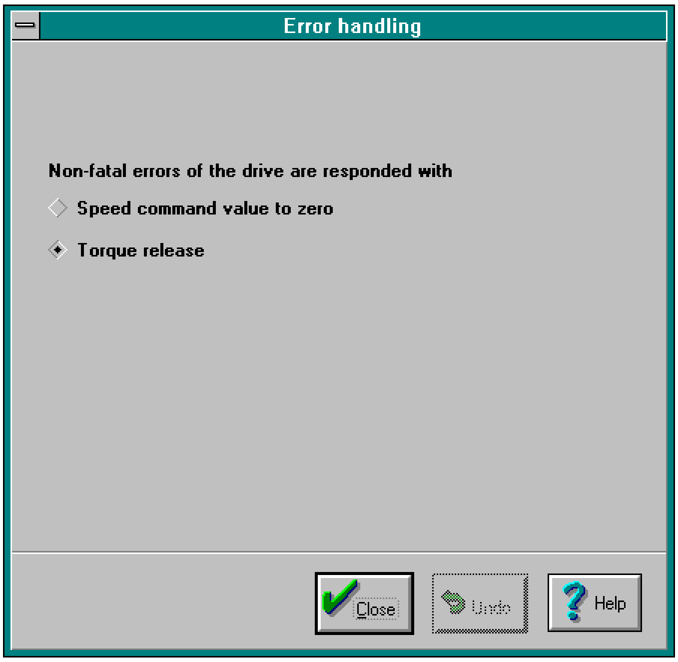


Fig. 10-9: Error handling

Error Classes

Errors are divided into different classes:

Error Class	7-Segment Display Message	Drive Response
Fatal	F8 / xx	Switch to torque free state
Traverse range	F6 / xx	Velocity command value set to zero
Interface	F4 / xx	may be selected
Non-fatal	F2 / xx	may be selected

Fig. 10-10: Error Classes

Note: Drive error reactions can be selected with two error classes as follows:

Drive Response

If the drive is in controlled mode and an error is detected, an error response is automatically carried out. An alternating indicator is visible on the H1 display (Fx / xx).

If the error allows for a variable response, either **switching to a torque free state** or **setting the velocity control value to zero** can be selected as the error response. After the drive has responded to the error it will automatically switch to a torque free state and open theinternal Bb ready-to-operate relay.

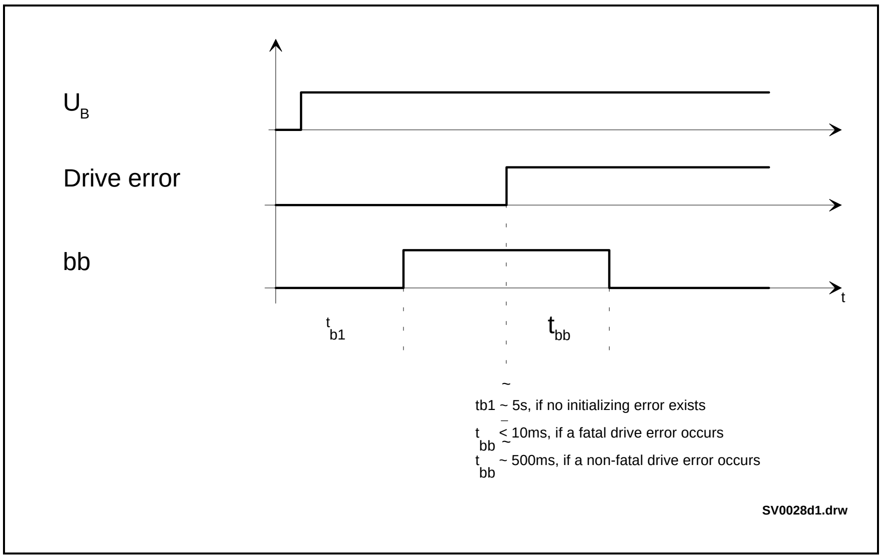


Fig. 10-11: bb-timing when switching on the supply voltage

10.5 Automatic control loop settings

General comments

To simplify parametrization of the drive, ECODRIVE offers automatic control loop settings. The user need only enter the conrol loop dynamics via the so-called damping factor. To achieve these dynamics the control parameters are automatically determined by starting command D9 in the drive.

Note that in order to perform the automatic control loop setting it is necessary to move the drive.

Note: The automatic control loop setting is not possible in either
- the speed synchronization
- or the angle synchronization

modes due to the modulo range defined in terms of 360°.
This means that to execute the automatic control loop setting, it is necessary to switch into "speed control" for example.

Precondition for starting the automatic control loop setting

WARNING

⇒ The function of the E-stop sequence and the travel range limit switch must be guaranteed and checked.

See also section 2, **Safety Instructions**

⇒ During command D9, the drive independently conducts motions, i.e., without externa command value default.

Travel range limits P-0-0166 and P-0-0167

Both travel range limits (**P-0-0166, lower travel range limit for automatic control loop settings and P-0-0167, upper travel range limits for automatic control loop settings)** are only active during the command "automatic control loop settings" and prevent the drive from moving out of its set limits only as long as the command is active.

When entering both limits (upper and lower) always **note** that the upper must be larger than the lower.

Upper limit P-0-0167 > lower limit P-0-0166 (cond1)

and

maximum travel distance=upper limit-lower limit>6 rotations cond2)

because the drive swings around the center position back and forth in automatic controlled setting between the upper and lower limits.

center= (upper limit + lower limits) / 2

If one of these conditions is not met, then the command is brought to end with error D905 wrong position range.

Actual position at start

The actual position must be within the limit defined by the aforementioned limits.

Otherwise, command error D906 position range exceeded will be immediately generated at command start.

Control loop setting

The control loop setting must be stable. This is generally achieved with the default control parameters stored in the motor feedback.

If this is not the case, however, then a very undynamic control loop setting (small P-gain and large reset time) in the speed control will lead to a usable basic setting for the automatic control loop setting.

Otherwise, the value for the actual speed filter must be reduced to 500µs.

Drive enable or drive start signal

The swinging motion and thus the automatic control loop setting is only conducted if

1) drive enable is present

and

2) drive start is generated.

If there is no drive enable signal at command start, then command error **D901 start only with RF**.

Command settings

All parameters participating in the command must be determined prior to command start so that they can become effective with the automatic control loop setting.

These relevant parameters are accessible in dialog "Automatic control loop settings" in DriveTop.

If command error D903 wrong position range displayed, then one of the following parameters has not been correctly parametrized. In other words, the speed, accel or the torque of the automatic control loop setting is too small.

- **P-0-0163, damping factor for automatic control loop setting** The desired control loop dynamics is set with this parameter.
- **P-0-0164, automatic control loop setting applicatins**
- **S-0-0092, bipolar torque/force limit value** Maximum effective motor torque can be set during automatic control loop settings via parameter S-0-0092, bipolar torque / force limit values. This limits torque which in turns limit the wear and tear of the mechanics.
- **S-0-0108, feedrate override** The feedrate override makes it possible to influence the speed during automatic control loop setting via the analog channel (Poti). It is also necessary, however, to activate this function in the DriveTop dialog "Jogging" (S-0-0108).

- **S-0-0259, positioning velocity**
  The effective speed during automatic control loop setting is set in this parameter.
- **S-0-0260, positioning acceleration**
  Using parameter maximum positioning acceleration, the acceleration needed for automatic control loop setting is set.
  If the value set is too small, then this can cause problems when determining the moment of inertia as the speed change and current values might then be too small.

Dialog for the automatic control loop setting

Note: 1) Control loop setting is connected with a drive motion. This means that the drive pendels around the center position set in parameters P-0-0166 and P-0-0167.
2) All necessary parameter settings must be made before the command is started.
3) To be able to make any other settings, use DriveTop prior to startup to open the dialog automatic control loop setting (Fig. 10-12).

Fixing travel range limits

Firstly, there is the option of defining the travel range by determining its limits. The upper and lower positions can be entered via the TeachIn function.

If, however, the limits have already been set, the user can leave this window by pressing "accept limits", and then proceeding to the next dialog window.

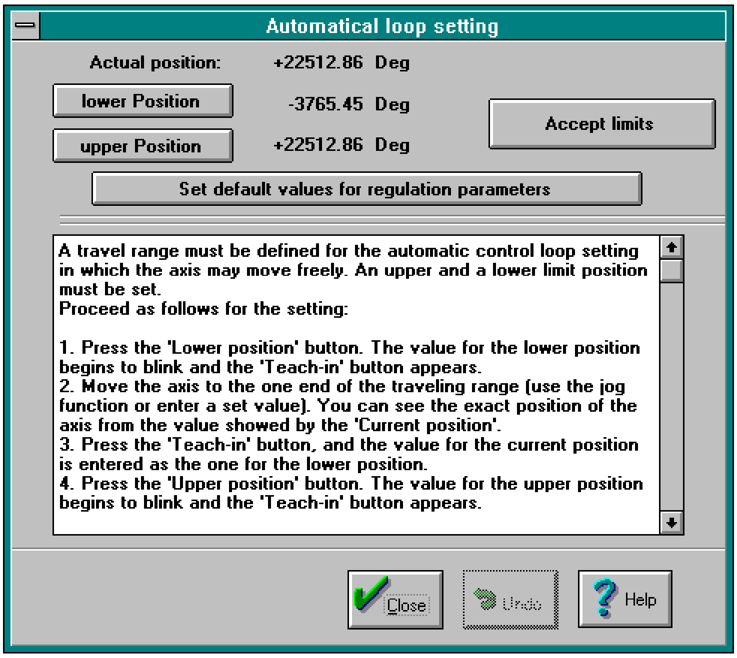


Fig. 10-12: Dialog 1 "automatic control loop settings" in DriveTop

Start command

The command can be set with DriveTop in dialog "automatic control loop setting" by pressing the key "Start automatic control loop setting" (See also Fig. 10-13).

Another option is to write the operating data of parameter **P-0-0162, D9 automatic control loop setting,** via the serial interface (RS232/RS485) with the binary numeric value 3 (11b).

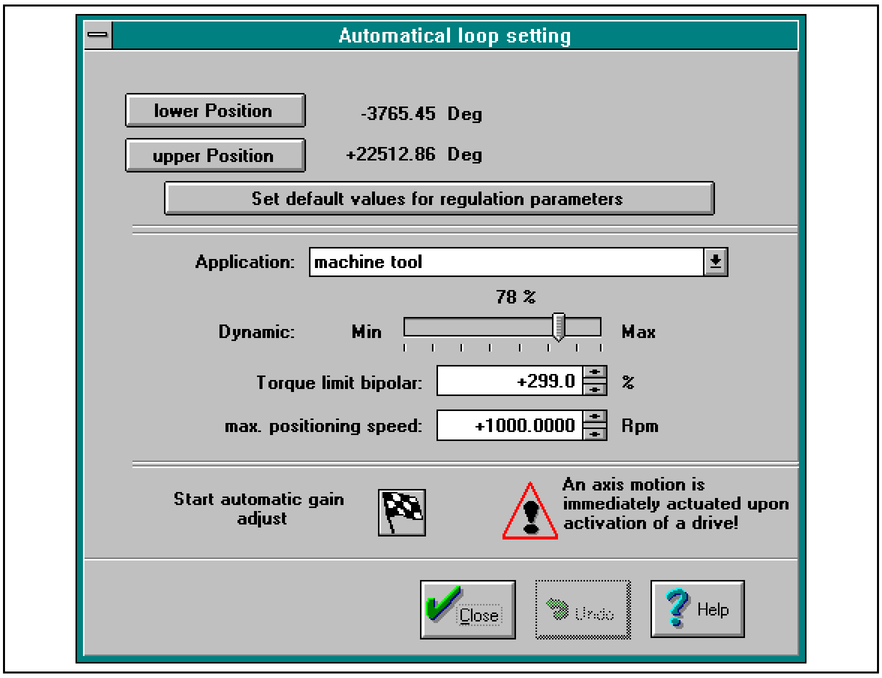


Fig.10-13: Dialog 2: "Automatic control loop setting" in DriveTop

Triggering a motion

An axis motion and thus also the performance of the automatic control loop setting is only possible if the **drive start** signal has been set.

Otherwise, command **D900, command automatic control loop setting** appears after start in the display and the axis does not move.

Triggering a motion by starting command D9

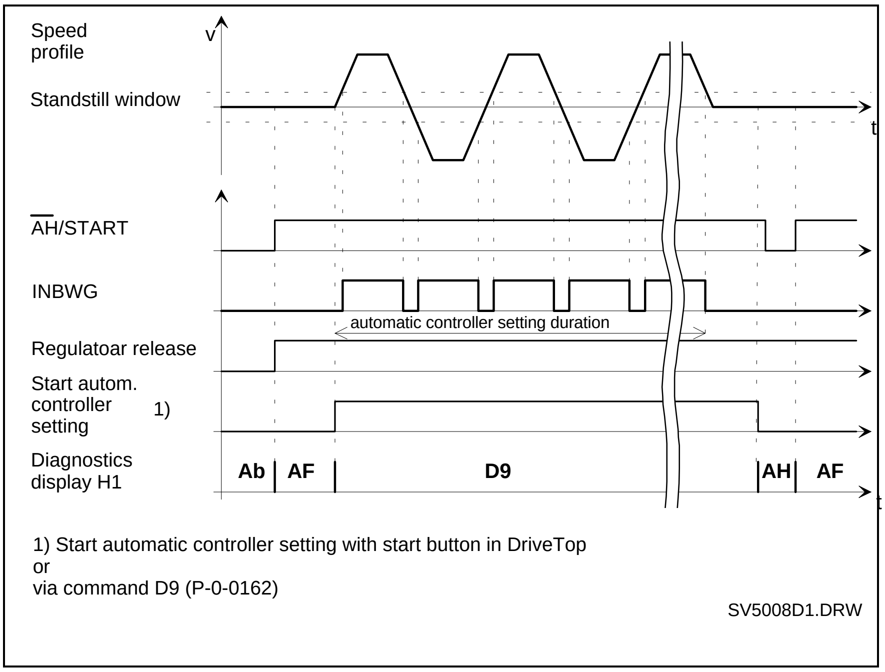


Fig. 10-14: Signal flow chart

Triggering a motion with AH/start

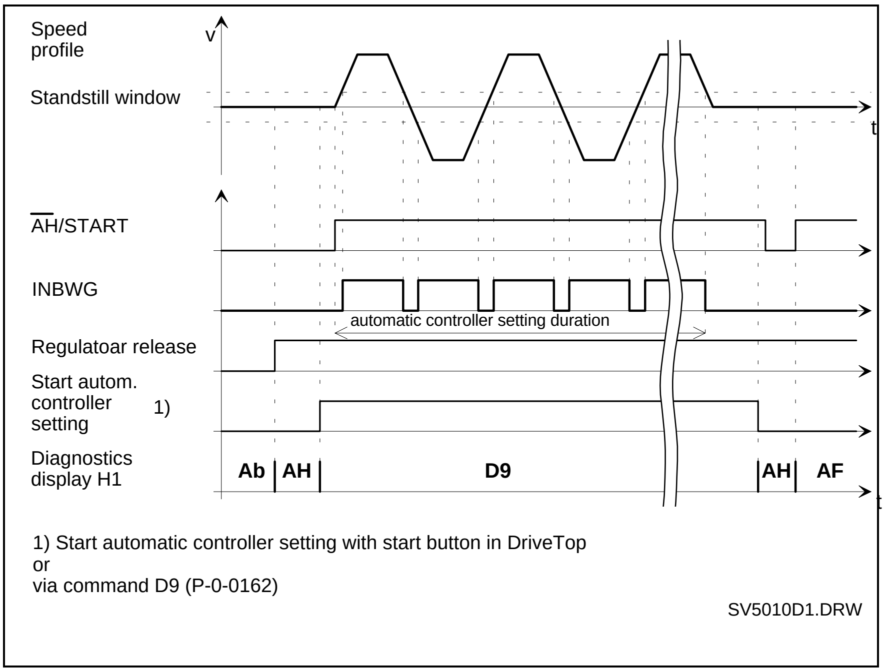


Fig. 10-15: Signal flow chart

Note:	Upon completion of the command, the drive always returns to the drive halt /AH state.

Interrupting a command with AH/start

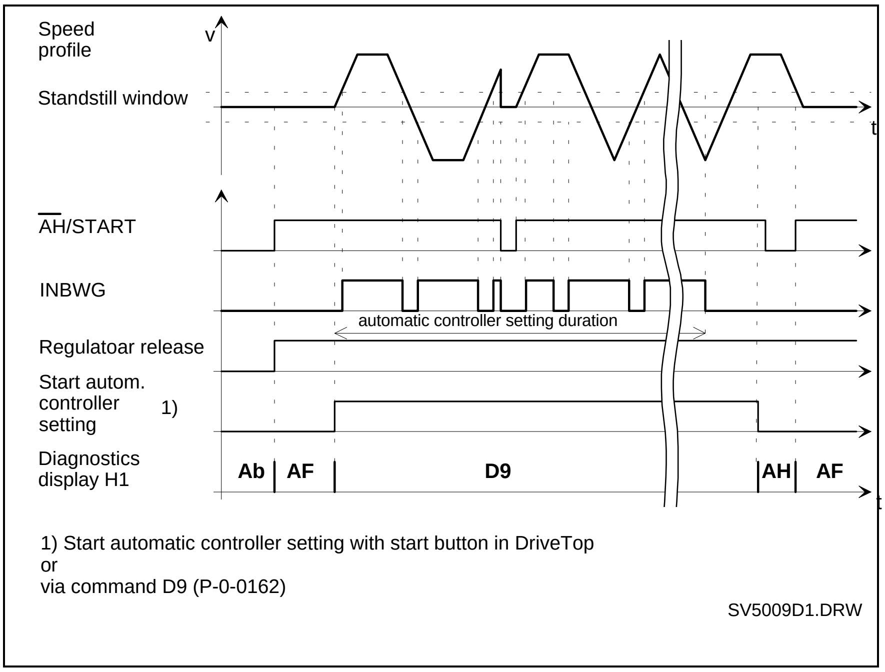


Fig 10-16: Signal flow chart

Note: There can be additional runthrough with altered settings. Two options are possible:
1) by removing and then re-applying the drive enable signal
2) by ending and then restarting the D9 command

Chronological sequence of the automatic control loop setting

The setup routine can be broken down into **seven individual steps**:

1st step:

Check for any command errors at command start.

2nd step:

Autonomous positioning at the center position between the two travel range limits (**P-0-0166** and **P-0-0167**) in position control**.**

3rd step:

Determining the total and extrinsic moment of inertia by evaluating accel and decel procedures.

The drive, in this case, moves within the previously set limits (**P-0-0166** and **P-0-0167**).

4th step:

Calculating and using the control parameters in the drive.

Parameters **P-0-0163, damping factor for automatic control loop setting and P-0-0164, automatic control loop setting applicatins** are taken into account.

5th step:

Checking the speed control loop and, if necessary, correcting the control parameter until the desired behavior is achieved (dependents on the dynamics set).

6th step:

Checking the position control loop and, if necessary, correcting the control parameter until the aperiodic behavior in the position control loop occurs.

7th step END:

Waiting for possible **restart** or **end command**.

The drive, in this case, is idle (speed 0 0) and D9 appears in the display.

Results of the automatic control loop setting

As a result of the automatic control loop setting both speed and position control loop are complete and stable.

The goal of the automatic control loop setting is an oscillation free behavior of the position control loop and a speed control loop behavior that is as dynamic as possible.

Note: The current control loop is not affected by the automatic control loop setting as this setting is load-independent and the optimum default values of the current control parameters are set at the factory.

The load moment of inertia of the drive reduced in terms of the motor shaft is determined as a by-product, and the maximum achievable positioning acceleration fixed.

P-0-4010, load inertia

The moment of inertia determined with the automatic control loop setting is stored in this parameter, meaning it can be accessed for reading but not or writing.

The parameter is backed up in the EEPROM.

P-0-0168, maximum acceleration

The maximum drive acceleration determined with the automatic control loop setting is stored in this parameter.

10.6 Manual control loop settings

General Information for Selecting the Control Loop Settings

The control loop settings in a digital drive controller are important for the performance characteristics of the servo axis. Determining the control loop settings requires expert knowledge.

The "optimization" of the control loop settings is generally not needed!

For this reason, motor-specific control parameters are available for INDRAMAT drives.

In some exceptional cases, however, it may be necessary to adjust the control loop settings to a specific application. The following section gives a few simple, but important rules for setting the control loop loop parameters in cases such as these.

In each situation the prescribed methods should only be viewed as guidelines which lead to a robust control setting. Specific aspects of some applications may require settings which deviate from these guidelines.

Loading Default Parameters

The **Load Default Parameter** function can activate defined control parameters. The parameters are determined for a matched moment of inertia relationship of $J_{motor} = J_{load}$. These parameters will work with standard applications.

Default values exist for the following parameters:

- **S-0-0106, Current Controller, Proportional Gain 1**
- **S-0-0107, Current Loop Integral Action Time**
- **S-0-0100, Velocity Loop Proportional Gain**
- **S-0-0101, Velocity Loop Integral Action Time**
- **P-0-0004, Smoothing Time Constant**
- **S-0-0104, Position Controller KV-Factor**
- **P-0-1003, Velocity Feedback Value Filtertimebase**

Executing the Basic LoadFunction After Changing the Motor or Drive Controller

The drive controller will recognize if it is operating with a changed motor type for the first time. The drive will read "UL" on the 7-segment display.

Pressing the S1 key on the drive controller or the reset button in the DRIVETOP diagnostic display will activate the standard control parameters in the drive.

See also **C700 basic load**

Executing the Basic Load Feature as a Command in the "Control loop Setting" Dialog

The standard control loop parameters can be activated in the "Control loop setting" dialog. This can create a stable default condition if the basic tuning valueshas been lost while changing the control loop settings.

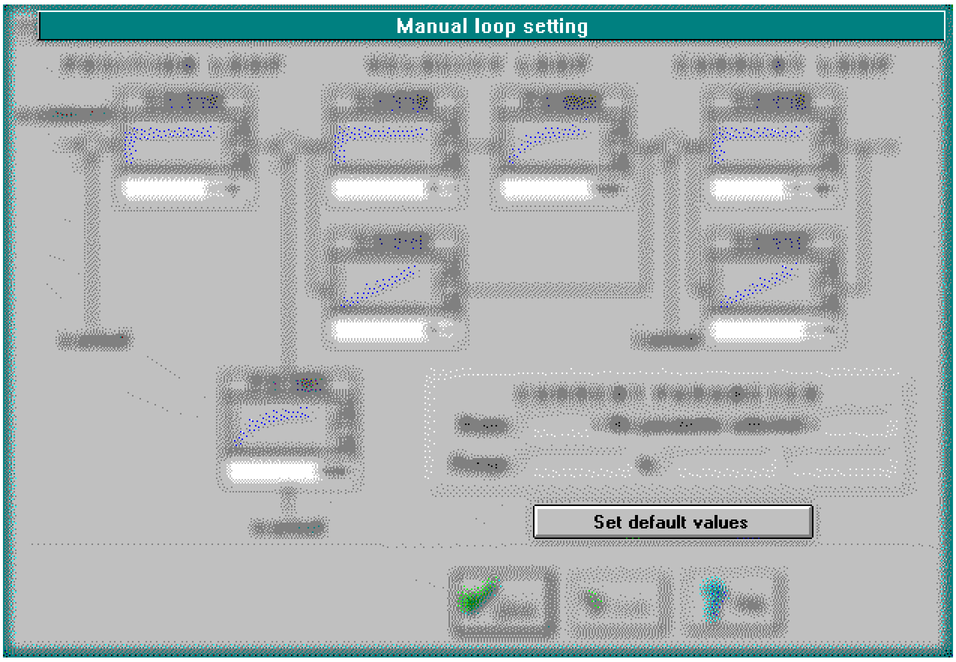


Fig. 10-17:Setting standard control parameters

Setting the Current Regulator

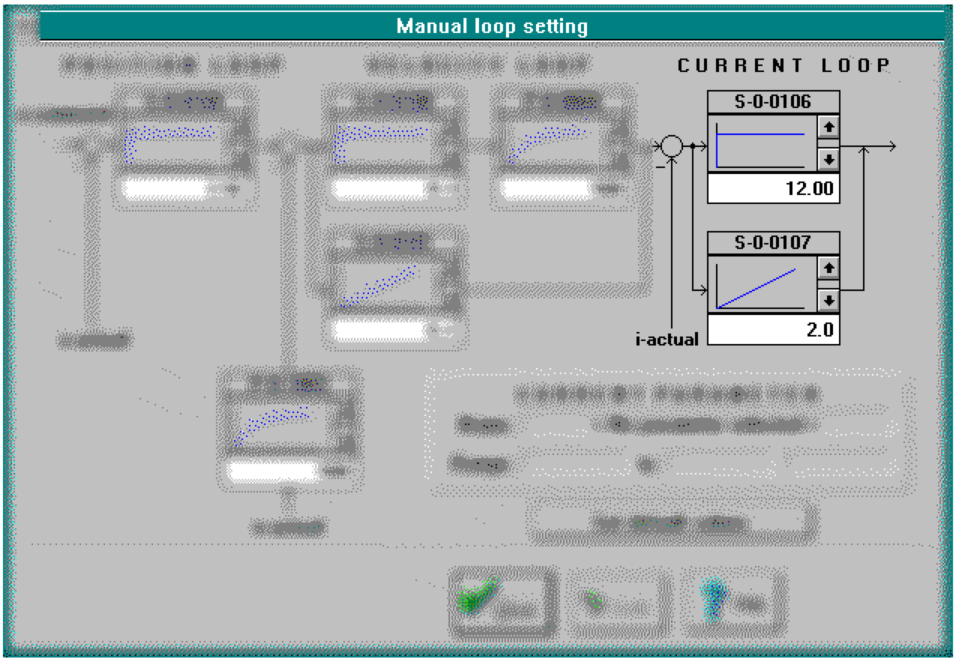


Fig. 10-18: Control loop settings: current loop

The parameters for the current control loop are set by INDRAMAT and cannot be adjusted for specific applications. The predefined parameter values are set during the basic load command (Set default values).

The parameters for the current regulator are set via the parameters

- **S-0-0106, current controller, proportional gain 1**
- **S-0-0107, current loop integral action time**

Note: Both parameters are write-protected as any change in the values defined by INDRAMAT is not permitted and could lead to damage to motor and drive controller.

Setting the Velocity Loop

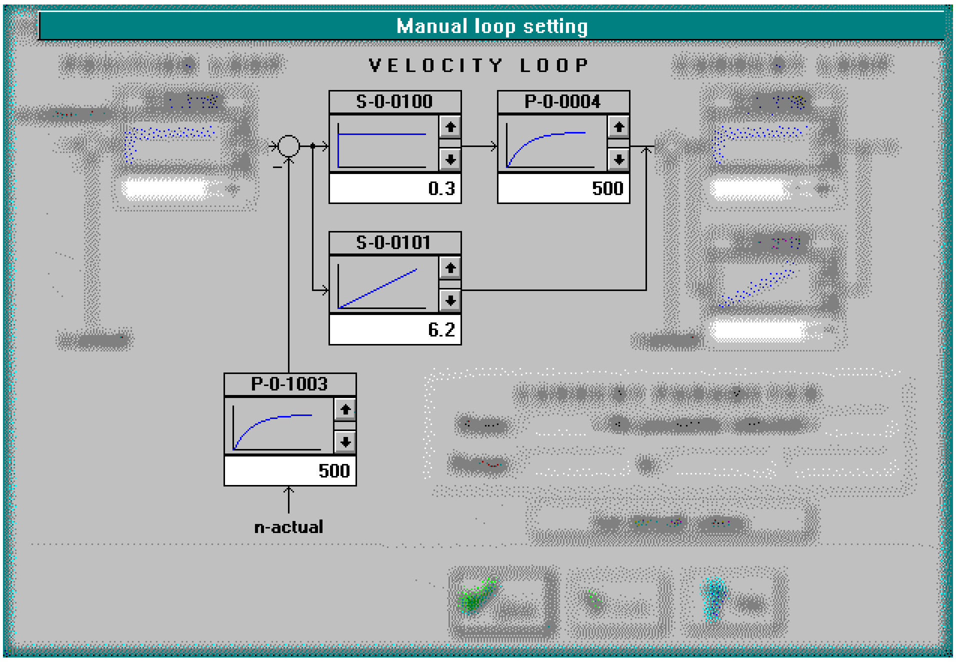


Fig. 10-19: Control loop settings: velocity loop

The velocity loop is set via the parameters

- **S-0-0100, velocity loop proportional gain**
- **S-0-0101, velocity loop integral action time**
- **P-0-0004, smoothing time constant**
- **P-0-1003, velocity feedback value filtertimebase**

These can be set by either executing the basic load function once or by completing the following procedure.

Preparations for Setting the Velocity Loop

A number of preparations must be made in order to be able to set the velocity loop:

- The mechanical system must be set up in its final form in order to have true relationships while setting the parameters.
- The drive must be properly connected as described in the user manual.
- The safety limit switches must be checked for proper functioning (if applicable)
- **Speed control with analog command value must be set as operating mode in the drive.**

Begin the adjustment procedure by setting the following parameters to the indicated values:

S-0-0100, Velocity Loop Proportional Gain = Default value of the connected motor.

S-0-0101, Velocity Loop Integral Action Time = 6500 ms

P-0-0004, Velocity Loop Smoothing Time Constant= Minimum value 500µs)

P-0-1003, Velocity Feedback Value Filter Time Constant = 500µs

Determining the Critical Proportional Gain and P-0-0004, Smoothing Time Constant

- After turning on the controller enable let the drive move at a low speed. (10...20 Rpm)
- Raise the **S-0-0100, Velocity Loop Proportional Gain** until unstable operating behavior (continuous limit cycle oscillations) begins.
- Determine the frequency of the oscillation by measuring the actual velocity with an oscilloscope. When the frequency of the oscillation is substantially higher than 500Hz, raise the **P-0-0004**, **Smoothing Time Constant** until the oscillation goes away. After this, raise the **S-0-0100, Velocity Loop Proportional Gain** until it becomes unstable again.
- Reduce the **S-0-0100, Velocity Loop Proportional Gain** until the oscillation goes away on its own.

The value found using this process is called the **"Critical Velocity Loop Proportional Gain."**

Determining the Critical Integral Action Time

- Set **S-0-0100, Velocity Loop Proportional Gain** = 0.5 x critical proportional gain. Set S-0-0101 to its default value.
- Lower **S-0-0101, Velocity Loop Integral Action Time** until unstable operating behavior results.
- Raise **S-0-0101, Velocity Loop Integral Action Time** until continuous oscillation stops

The value found using this process is called the **"Critical Integral Action Time."**

Determining the Velocity Control loop Setting

The critical value which is determined can be used to derive a control loop setting which possesses the following characteristics:

- Independent from changes to the axis since there is a large enough safety margin to the stability limits.
- Safe reproduction of the characteristics in production machines.

The following table shows many of the most frequently used application types and the corresponding control loop settings.

Application Type:	Velocity Loop Proportional Gain:	Velocity Loop Integral Action Time:	Remarks:
Feed axison standard machines tools	Kp = 0.5 x Kpcrit	Tn = 2 x Tncrit	Good load rigidity and good drive characteristics
Feed axis on perforating machines or punch machines	Kp = 0.8 x Kpcrit	Tn = 6500	High proportional gain; no I-gain to achieve short transient periods.
Feed drive on cut off device	Kp = 0.5 x Kpcrit	Tn = 6500	relatively undynamic control loop setting without I-gain to avoid bracing the materialto be separated with the separation device.

Fig. 10-20: Application specific velocity control loop settings

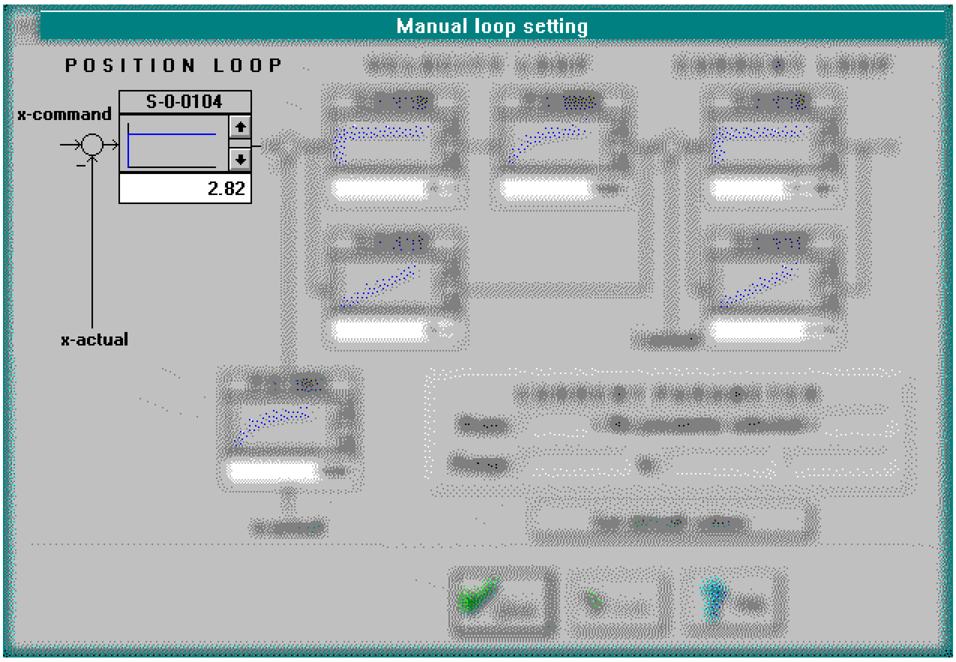


Fig. 10-21: Control loop setting: Position loop

Setting the position loop is done with the parameter

- **S-0-0104, Position Controller KV-Factor**

This can be set by either executing the basic load function once or by following the process which follows.

Preparations for Setting the Position Control Loop

A number of preparations must be made in order to be able to set the position regulator:

- The mechanical system must be set up in its final form in order to have true relationships while setting the parameters.
- The drive must be properly connected as described in the user manual.
- The safety limit switches must be checked for proper functioning (if applicable)
- The **Position Regulation** operating mode must be selected in the drive controller.
- The underlying velocity controller must be properly adjusted. The beginning value selected for the Kv-factor should be relatively small. (Kv = 1)

Determining the Critical Position Loop Gain

- Run the drive in a mode in which the position regulation loop is closed in the drive.
- Run the shaft at a low speed (10...20 Rpm) via the jog-function of the connected NC-control, for example.
- Raise the Kv-factor until operation begins to be unstable.
- Reduce the Kv-factor until the continuous oscillation disappears by itself.

The Kv-factor determined through this process is the **"Critical Position Control loop Gain"**

Determining the Position Regulator Setting

In most applications an appropriate position regulator setting will lie between 50% and 80% of the critical position control loop gain.

This means:

S-0-0104, Position Loop KV-Factor = 0.5 ... 0.8 x Kv_{crit}

10.7 Loop Monitoring

The following loop monitors are provided to ensure that the control drive functions properly:

- Velocity loop monitoring
- Position loop monitoring

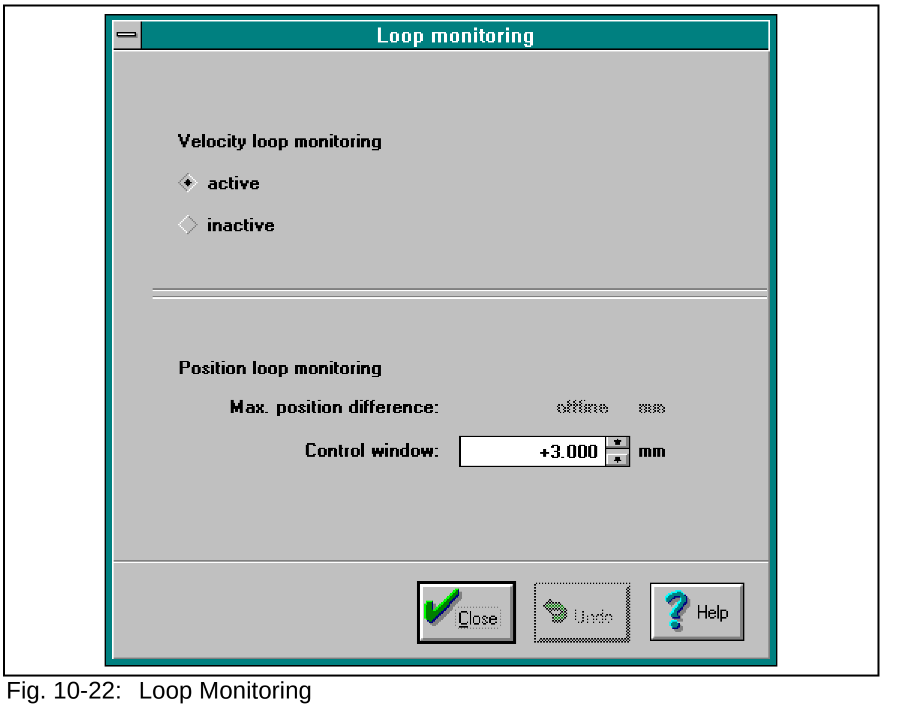


Fig. 10-22: Loop Monitoring

Velocity Loop Monitoring

The velocity loop monitor can be activated in the following operating modes:

- Velocity control with analog command value
- Position control with step motor interface
- Position control with positioning interface
- Speed synchronization of real master axis
- Angle synchronization of real master axis

See also **F878 velocity loop error**

Primary Mode of Operation for the Velocity Loop Monitor

The following criteria must be met for the speed control loop monitor to be triggered.

- Speed control goes to the limits
- Drive accelerates in the wrong direction
- Actual speed command value greater than 1.25% of maximum motor speed
- Speed deviation exceeds 10% of maximum motor speed

If these criteria are met over a period of more than 16 ms, then error "F878 velocity loop error" is generated and the axis goes torque-free.

The reasons that speed control monitor is actuated can be:

- Faulty wiring in the motor power cables
- Defect in the power supply of the control drive
- Defect in the feedback system
- Insufficient gain in the velocity regulator parameters

Deactivating the Velocity Loop Monitor

DANGER

Control drive errors or faulty wiring can lead to uncontrollable shaft movements.

⇒ The velocity loop monitor should be activated under normal circumstances and should only be deactivated in certain exceptions.

The velocity loop monitor can be deactivated for specific applications in which the control drive is specifically operated at its power limit. (An example: Moving to a positive stop and similar situations)

Position Loop Monitoring

The position loop monitor helps to diagnose errors in the position control loop.

See also **F228, excessive deviation**

Primary Mode of Operation for the Position Loop Monitor

An estimated position feedback value is generated from the position command value. If the difference between the measured and the estimated position feedback value is larger than the value entered in the monitoring window, the control drive will execute its error handling routine according to the parameters which have been set. (See also Error Handling)

Possible Reasons for triggering the position loop monitor:

- Exceeding the torque or acceleration capability of the drive.
- Blocking of the axis mechanical system
- Disruptions in the position feedback
- Exceeding the maximum velocity of the motor by entering too large of a traversing velocity or giving too large of a position command value difference.
- incorrectly parametrized control loop

Requirements for Setting the Position Loop Monitor Correctly

- Be sure that the velocity and position control loops are set properly.
- The axis in question should be checked in regards to its mechanical aspects and should be in its final condition.

Setting the Position Loop Monitor

A typical processing or load cycle should be entered into the connected control system. In so doing the maximum intended velocity and acceleration should be reached.

In the "Maximum position variance" parameter the maximum variance between measured and estimated position feedback values is continually displayed.(**Note:** The contents of this parameter are not saved on-line; this means that when the power supply is turned on its contents equal zero)

The value determined for the maximum position variance acts as a help for setting the monitoring window. The contents of the "maximum position variance" parameter multiplied by a safety factor are to be set in the "Monitoring window" parameter. A safety factor between 1.5 and 2.0 is recommended.

10.8 Status Message

The current status of the drive can be determined by a superordinate control through different status messages and evaluated for technical control purposes. Four status messages are available in addition to the potential free operating condition contact (Bb) which indicates readiness for use in closed position.

Ready for Work (bb)

The control drive indicates that no internal error is present through the operating condition contact "Bb". After the supply voltage is switched on the control drive initializes itself. If the initialization is successful, the Bb-contact will close after several seconds. After this the mains power supply can be switched on and the control drive can be put into operation.

When an internal error occurs the Bb-contact opens. The time delay between the occurrence of the error and the opening of the Bb-contact depends on the type of error. For fatal errors the contact is opened immediately, while for non-fatal errors the internal error handling routine is executed first.

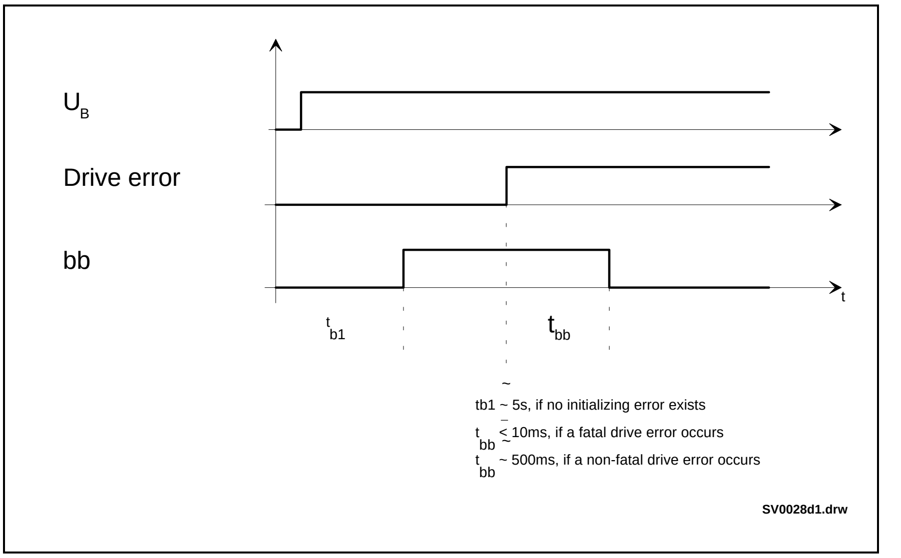


Fig. 10-23: bb-Timing when switching on the supply voltage

In Position (INPOS)

Positioning operation modes (position control)

The message "INPOS" applies for positioning operation and drive controlled homing procedures.

The message "INPOS" is given by the drive if the following requirement has been satisfied:

- The difference between the target position and the actual position is less than the value set in the position window parameter.

$$|\text{target position} - \text{actual position}| < \text{position window}$$

Fig. 10-24:

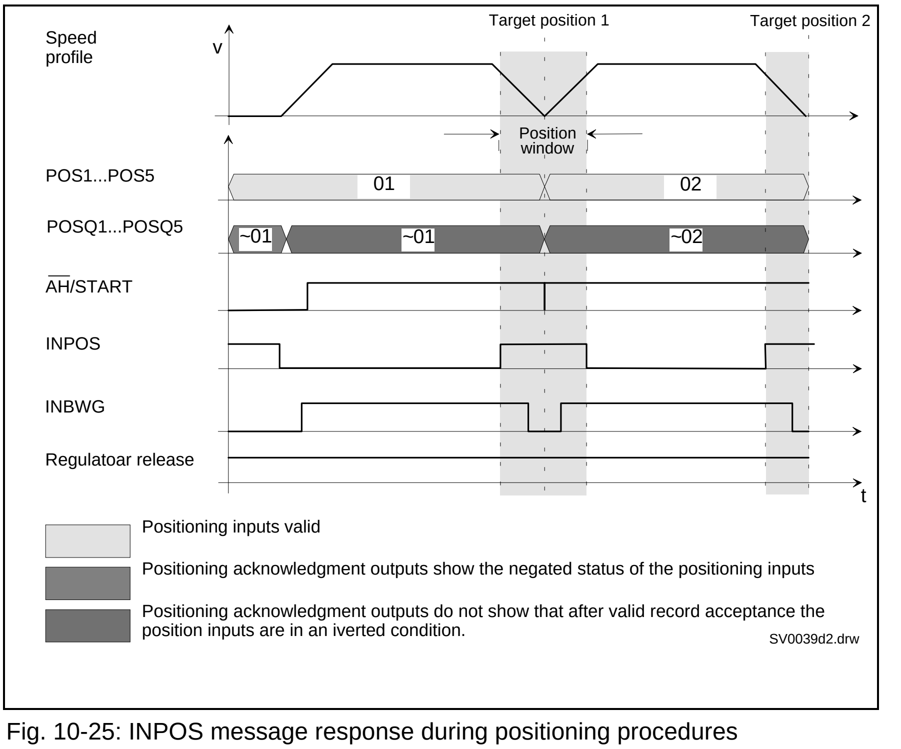


Fig. 10-25: INPOS message response during positioning procedures

Note: After a positioning command is started, the INPOS message is set to zero at the same time as the output of the command selection acceptance POSQ, as long as the target position has not yet been reached.

Synchronization modes

The INPOS message is used with angle and speed synchronization to signal synchronous operations.

This message can help a superordinate control system determine the correct completion of a positioning command.

See also **Section 9.3 Check-back with speed synchronization** and **Section 9.4 Check-back with angle synchronization**

Note: The INPOS-message defaults to being inactive during jogging and when the controller enable is switched off.

Step motor operating modes

The INPOS message is generated in this mode with step motor interface if the difference between position command value (set via step motor control) and the actual position value is less than the value set in parameter positioning window **(S-0-0057).**

$$\left| \text{pos.comm.val.} - \text{act.pos.val.} \right| < \text{pos.window}$$

Fig. 10-26:

Analog operating modes (torque and speed control)

The INPOS message in these modes is meaningless.

In Motion (INBWG)

The INBWG message is given if the drive is moving at a velocity which is larger than the value set in the standstill window parameter.

Note: If an extremely small value is selected for the standstill window, the drive may display INBWG even though it is not in motion. This can be explained by the gradual dissipation of the actual velocity. Entering larger values will solve this problem.
(Standstill window = 20 Rpm)

See also **S-0-0331, status feedback = 0**

In Reference (INREF)

INREF messages show that the internal position feedback value refers to the machine zero point. The INREF message has the following properties:

- In applications with motors with resolver feedback, the INREF message is only given after successful execution of the drive internally controlled homing procedure.
- In applications with motors with resolver feedback and absolute encoder option, the INREF message is given after the supply voltage is switched on. This requires that the Set Absolute Measurement command has previously been given.

See also **S-0-0403, position feedback value status**

Position Switch Point (WSP)

The DKC has a function for actualizing a position switch point. A switching signal is given at a position set by parameter which can be sent to a PLC for further processing. This enables position-dependent switching functions to be activated. The logic of the position switch point is as follows:

Actual position >
Position switch point function : Path switch point output = 1

Actual position <
Position switch point function : Path switch point output = 0

The path switch point signal can be negated to adapt to a superordinate control.

See also **S-0-0059, position switch flag parameter**

Note: The position switch point function is only active in control drives which have been homed, because the absolute relationship to the machine's zero point can only be known in a control drive in which the homing procedure has been carried out.

Position Switch Point When Using Motors With Resolver-Feedback (Standard)

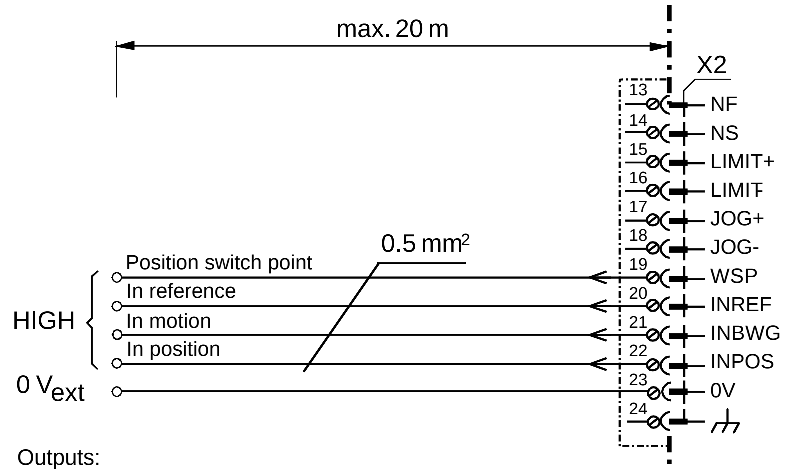
Before using the position switch point function the drive controlled homing procedure must be executed.

Position Switch Point When Using Motors with Resolver-Feedback and Absolute Encoder (Optional)

If a switch signal is needed within the travel region of an axis, it is usually realized with a cam actuated switch attached to the machine mechanical system.

By using a motor with absolute encoder (optional) **ECODRIVE** saves the unnecessary expenditure for a mechanical cam switch. When using a motor with absolute encoder the homing procedure is available as soon as the supply voltage is turned on. Consequently, the position switch point signal is also valid and can be used as a replacement for a mechanical cam switch.

Illustration of Status Output Connections



Outputs:

Output voltage	min.	max.
HIGH	16 V	Uext.
LOW	0 V	1 V
Output current 1 out	80 mA	
Rise time, fall time	approx. µ5 s	
Overload protection	at 1 out > 300 mA the outputs switch to LOW	

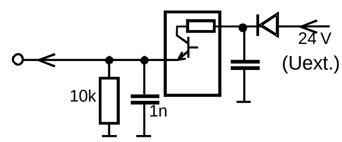


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Fig. 10-27: Status outputs

10.9 Actual Position Output

The DKC has an actual position value output to transmit the actual position value to a NC-control. Actual position values can be transmitted in either incremental or absolute form.

Incremental Encoder Emulation

Both the

- actual position vaue and
- the position command value

can be generated here.

Selecting incremental encoder emulation as the actual position output gives out 5V-TTL incremental encoder signals with an adjustable line count value. Incremental actual position value output is possible with both relative position actual value representation as well as with absolute actual position value representation.

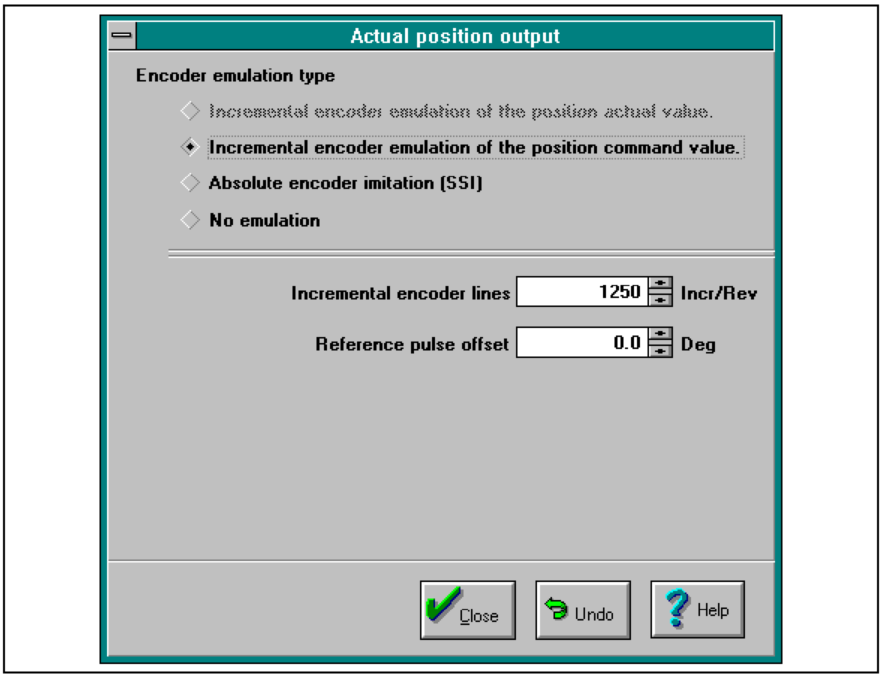


Fig. 10-28: Actual position output

P-0-0502, Line Count for Incremental Encoder

The line count value of the incremental encoder to be emulated determines the number of cycles to be emitted per rotor revolution. This number is equivalent to the graticule line count value which the code plate of a conventional incremental encoder would exhibit.

All graticule line count value can be set between 1 and 65536 lines per revolution.

See also **P-0-0502, line count for incremental encoder**

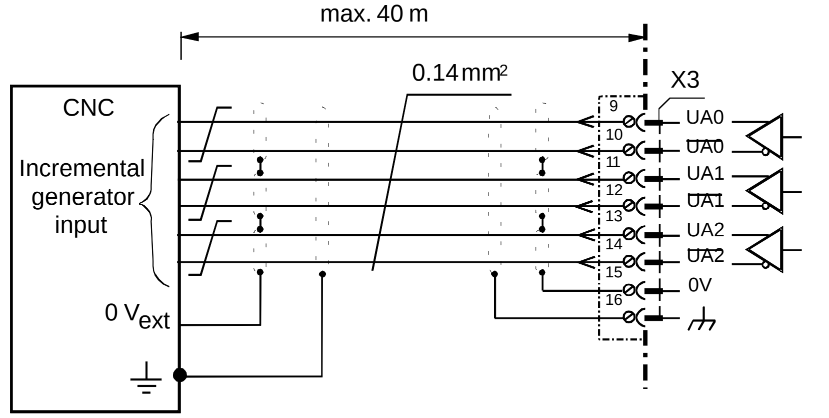
P-0-0503, Reference Pulse Offset

The relative position of the homing marker impulse of the incremental encoder to be emulated can be extended with the homing marker pulse offset parameter. Shifting the homing marker pulseis necessary when the position of the home switch switching flank and the homing marker pulSee also do not permit a well-defined homing procedure. Controlling the relative position of the homing marker pulse makes the manual adjustment of the home switch cam unnecessary.

The homing marker pulse offset applies to the motor shaft and can be entered in the range from 0 ... 359.9°. A positive offset value shifts the relative position of the homing marker pulse clockwise with respect to the motor shaft keyway.

See also **P-0-0503, reference pulse offset**

Illustration of the Incremental Actual Position Value Output Connections



Difference outputs:

Output voltage	min.	max.
HIGH	2.5 V	5 V
LOW	0 V	0.5 V
Output current 1_{out}	max. |20| mA	
Output frequency	max. 504 kHz	
Overload protection	Outputs may not be short circuited! Danger of damage!	

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Fig. 10-29: Incremental actual position value output

Absolute Encoder Emulation (SSI)

When absolute encoder emulation is selected, the absolute position value is emitted in the standard SSI-format for absolute position encoders. The absolute actual position value output is only of use when using a motor with absolute encoder (optional).

Absolute position output offers the advantage of making the absolute position of the axis, in reference to a machine home point, available immediately to the connected control after the control voltage has been switched on.

The position which is given out is always in reference to the motor shaft (and cannot be given in reference to the load through mechanical transmission elements).

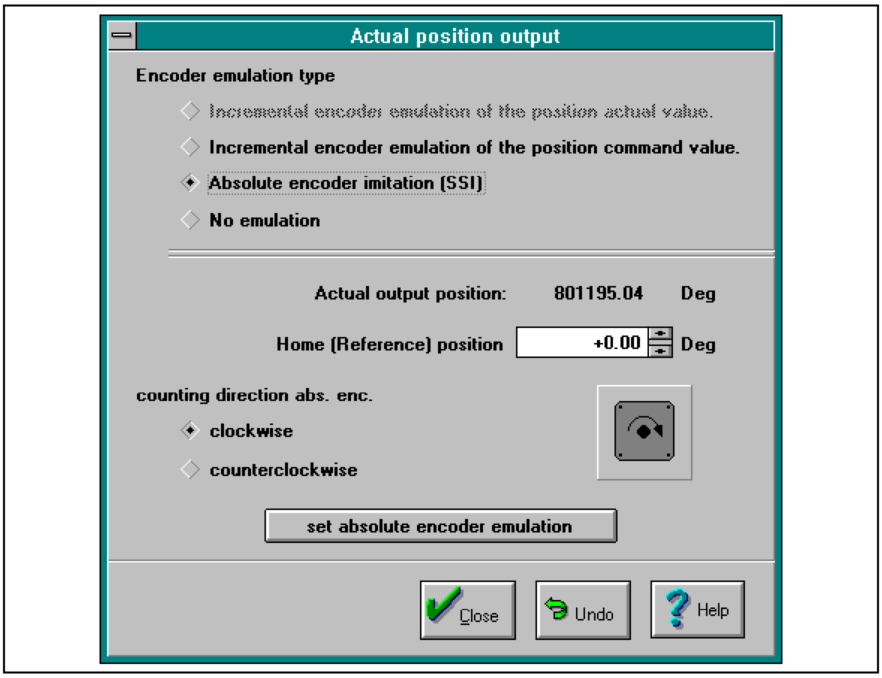


Fig. 10-30: Actual position output

Requirements for Using Absolute Encoder Emulation

The NC-control system which is connected must have a SSI input and be able to process SSI data in 25-bit format.

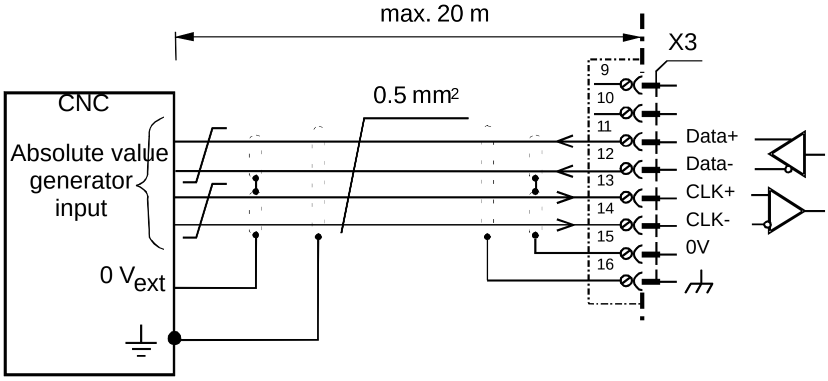
The MKD motor used must be equiped with a multiturn absolute encoder. (Ordering option)

Calibrating the Absolute Encoder Emulation

Setting up the absolute encoder emulation requires a one-time calibration. This calibration procedure is made up of the following steps:

- The polarity of the position information which is transmitted should first be checked for accuracy to prevent positive feedback in the position control loop. Additionally, the position display of the connected control system should be watched while moving the shaft at the same time. (The movement can be controlled manually, with the battery box or with the jogging function.) If the position does not change in requisite manner, the output polarity 09 must be reversed with the "Absolute encoder-counting direction" parameter.
- The shaft should be moved to a position known in reference to the machine coordinate system.
- The desired output position should be entered in the "Home position" parameter.
- If the drive is in the desired position, the "Set absolute encoder emulation" command should be selected. Doing this sets the current transmitted position equal to the value given as the home position.

Illustration of Absolute Actual Position Value Output Connections



Difference outputs:

Output voltage	min.	max.
HIGH	2.5 V	5 V
LOW	0 V	0.5 V
Output current 1_{out}	max. |20| mA	
Overload protection	Outputs may not be short circuited! Danger of damage!	

Difference inputs:

Input voltage	min.	max.
HIGH	2 V	5 V
LOW	0 V	0.8 V
Input resistance	12 kOhm	
Clock frequency	(100-1000) kHz	

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Fig. 10-31: Absolute actual position value output

10.10 Drive controlled Homing Procedure

In operating modes

- positon control with positioning interface
- position control with step motor interface
- angle synchronization
- and speed synchronization

it is possible to establish the dimensional reference to machine zero point via the drive-internal referencing procedure .

Note: In operating modes with the analog interface the measurement relationship to the machine zero point should be set via the connected control system. Consequently, the "Drive Controlled Homing Procedure" function is not available in these applications.

Homing When Using a Motor With Resolver Feedback (Standard)

Absolute positioning sets and position limit value monitoring can only be used after the drive controlled homing procedure is successfully executed.

The homing procedure should be used in the following situations when using a motor with resolver feedback:

- After turning on the control voltage
- Whenever there is a transition from operating mode to parameterization mode and back to operating mode.

The status message INREF signals to a connected control system that the drive has established a measurement relationship, or, in other words, that the homing procedure was successfully executed. This message must be processed immediately for applications which require a measurement relationship.

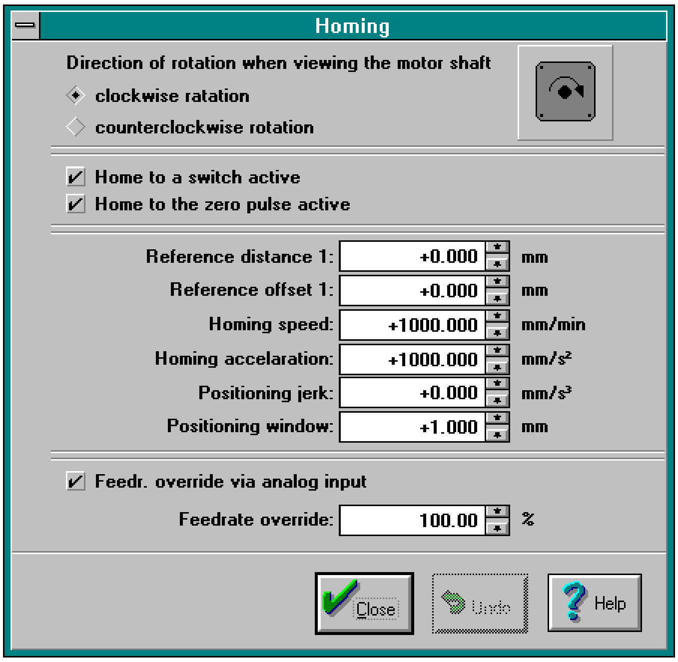


Fig. 10-32: Drive controlled homing procedure for motors with resolver feedback

Determining the Direction of Motion During the Homing Procedure

The user must determine the direction of motion for the drive controlled homing procedure in conjunction with the machine mechanical system, the adjustment of the home switch and/or the determination of the home point. This determination always occurs in relation to the motor shaft without regard to the axis mechanical system.

Four different referencing options are available:

Evaluation of reference point switch active	Evaluation of position encoder reference mark active	Referencing mode with evaluation of the
yes	yes	referencing point switch and position encoder reference mark
yes	no	referencing point switch
no	yes	positiong encoder reference mark
no	no	to the actual position value

Fig. 10-33: Overview of the types of referencing with resolver feedback

Homing with Evaluation of the Home Switch

The drive is in motion at the specified acceleration and velocity in the home direction until it receives the home switch signal. This point is the home point (or reference point). The control drive will then brake, reverse direction, and move back to the home point.

If the axisis located at the home switch cam at the start of the drive controlled homing procedure, it will move away from the cam until the home switch signal is removed, reverses direction, and head back towards the home switch cam until the edge of the home point switching signal is received.

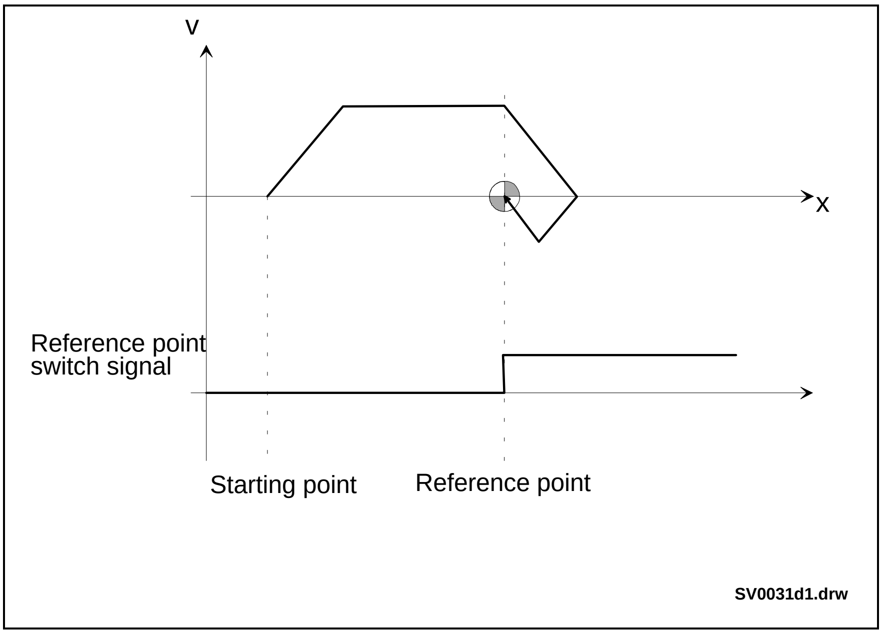


Fig. 10-34: Homing with Evaluation of the Home Switch

Homing with Evaluation of the Position Encoder Homing Mark

The drive moves at the specified acceleration and velocity in the home direction and positions itself on the next homing Mark of the motor encoder. This point is the home point.

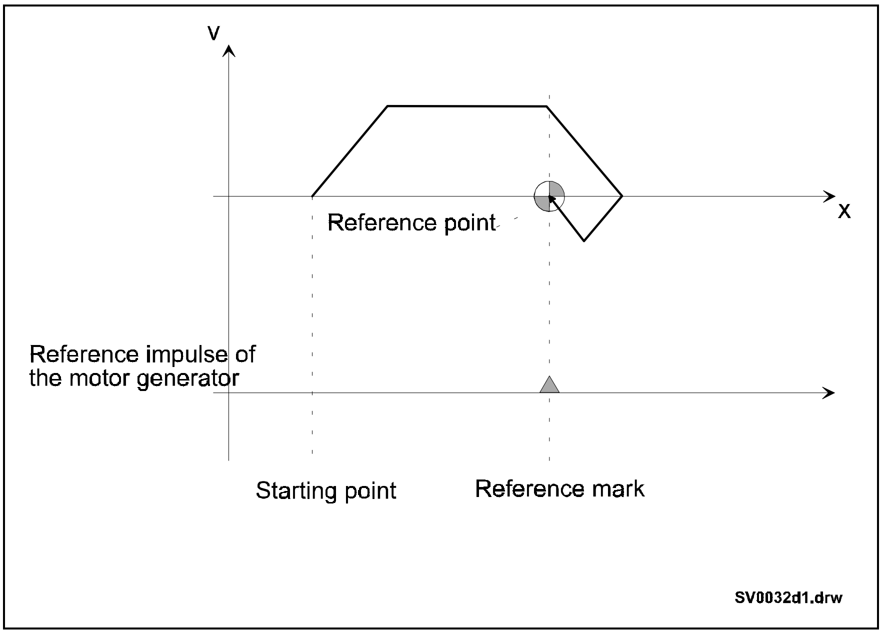


Fig. 10-35: Homing with evaluation of the position transmitter homing mark

Note: Multiple homing marker pulses per motor revolution will appear with MKD motors:

- MKD025 / MKD041: 3 homing marks
- MKD071 / MKD090 / MKD112: 4 homing marks

Homing With Evaluation of the Home Switch and the Home Mark

The drive moves in the home direction until it receives the home switch signal. The control drive then positions itself on the next motor encoder homing mark which appears. This point is the home point.

If the axis is on the home switch cam at the start of the drive controlled homing procedure, it will first move away from the cam until the home switch signal is removed, reverse direction, and head back again in the direction of the home switch cam to find the home point.

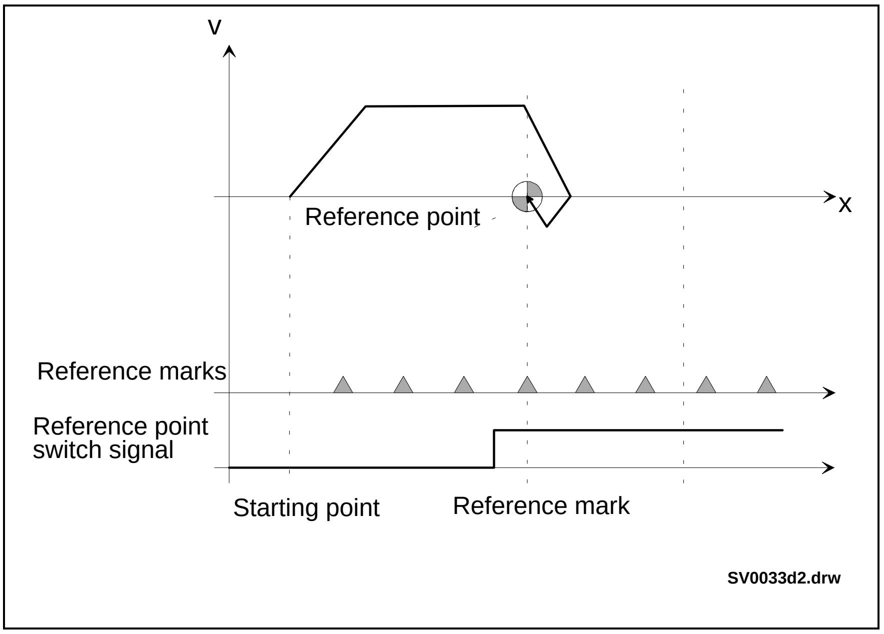


Fig. 10-36: Homing with evaluation of the home switch and the home mark

Note: S-0-0041, referencing speed may not exceed 1000 rpm (as this relates to the motor shaft) as otherwise the positon of the reference point switch signal and the reference mark of the motor encoder cannot be unequivocally allocated.

Homing to the Current Actual Value

The control drive is not in motion. The actual position value is set equal to the value of the "**S-0-0052, Reference Distance 1**" parameter immediately after the homing procedure is activated.

Homing Parameters

Reference Distance 1

When the internal homing procedure is finished the control drive positions itself on the home point and enters the value of the "**S-0-0052, Reference Distance 1**" parameter in the current actual position value.

Reference Offset 1

The home point can be offset in relation to the home reference of the motor encoder via this parameter.

When the motor is attached to a specific mechanical system the home mark of the motor encoder is in an arbitrary position with respect to the desired home point. Zero should initially be entered in the reference offset parameter when setting up. After the first homing attempt, calculate the difference between the desired home point and the position where the control drive stops at the end of the first homing procedure.

This value should be entered in the **S-0-0150, Reference Offset 1** parameter, while paying attention to its sign. After another homing procedure the control drive will be in the desired home position.

Homing velocity, Homing acceleration and Positioning Jerk

These parameters determine the motion profile of the control drive while executing the drive controlled homing procedure. These parameters must be set for each specific application.

Positioning Window

The drive must be positioned on the home point at the end of the homing process. If the control drive moves around the home point within the positioning window, the control drive will recognize the successful completion of the homing procedure and will display the INREF (In Reference) message.

Note: The **S-0-0057, Position Window** parameter is also used in connection with the positioning sets.

What affects speed during drive-guided referencing

The velocity at which the control drive moves during the homing procedure can be controlled with the **feedrate override function**. The value in the **S-0-0108, feedrate override** parameter determines at what proportional velocity, in relation to the programmed **S-0-0041, homing velocity**, the drive should move. In other words, at 100% the control drive will move at 100% of the homing velocity value.

A continual reduction of the velocity can be made via the analog command value input. To do this the "Feedrate-Override Variable via Analog Input" field must be activated.

Detailed information on this can be found in the chapter "**feedrate override function**".

The function **positioning with limited speed** also affects referencing speed.

Home Switch Configuration

The home switch cam should be conFig.d as shown the Fig. shown below to ensure that the homing procedure can be started from any position in the transversing range.

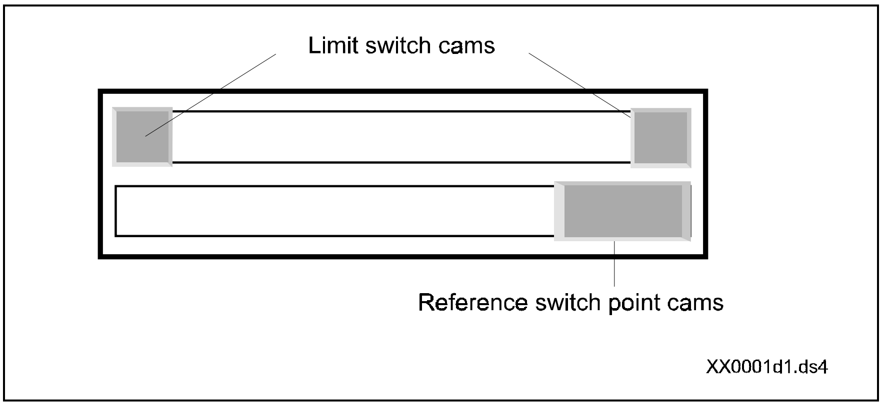
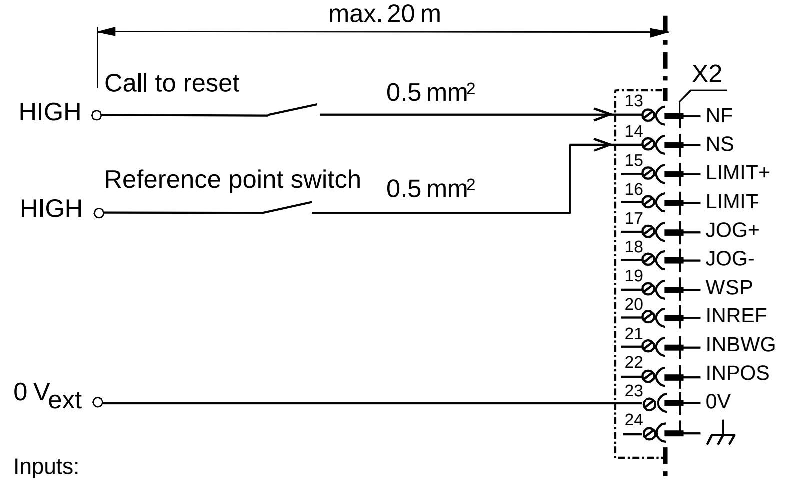


Fig. 10-37: Configuration of the home switch cam

Connecting the Home Command and Home Switch Inputs



Inputs:

Input voltage	min.	max.
HIGH	16 V	30 V
LOW	-0.5 V	8 V
Input resistance	approx. 8 kOhm	

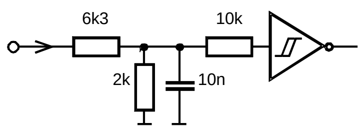


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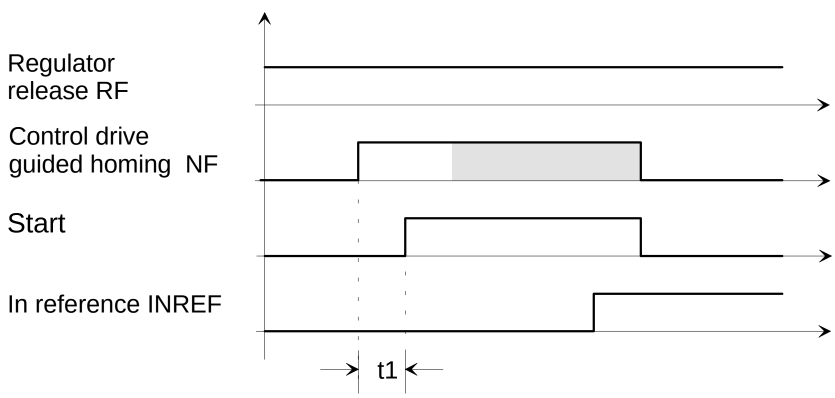
Fig. 10-38: Connecting the home command and switch inputs

Ending the Drive Controlled Homing Procedure

The homing procedure can be interrupted by the following series of signals:

The homing procedure is selected at the NF signal input. Activating the START-signal begins the homing procedure. After successful complete of the procedure the message INREF (In Reference) is given. Deactivating the NFsignal and the AH/STARTsignal can terminate the homing procedure.



t1 > 2ms

SV0034d1.drw

Fig. 10-39: Drive controlled homing procedure

Homing When Using a Motor With Integrated Absolute Encoder Function (Optional)

When using a motor with an integrated absolute encoder function (optional) the measurement relationship is available immediately after turning on the supply voltage, assuming that the "**P-0-0012, Command 'Set Absolute Measurement'**" was executed during the initial installation.

This enables execution of absolute process blocks without a homing procedure immediately after the supply voltage is switched on.

The status message INREF (In Reference) signals to the connected control system that the drive has a measurement relationship to the machine zero point.

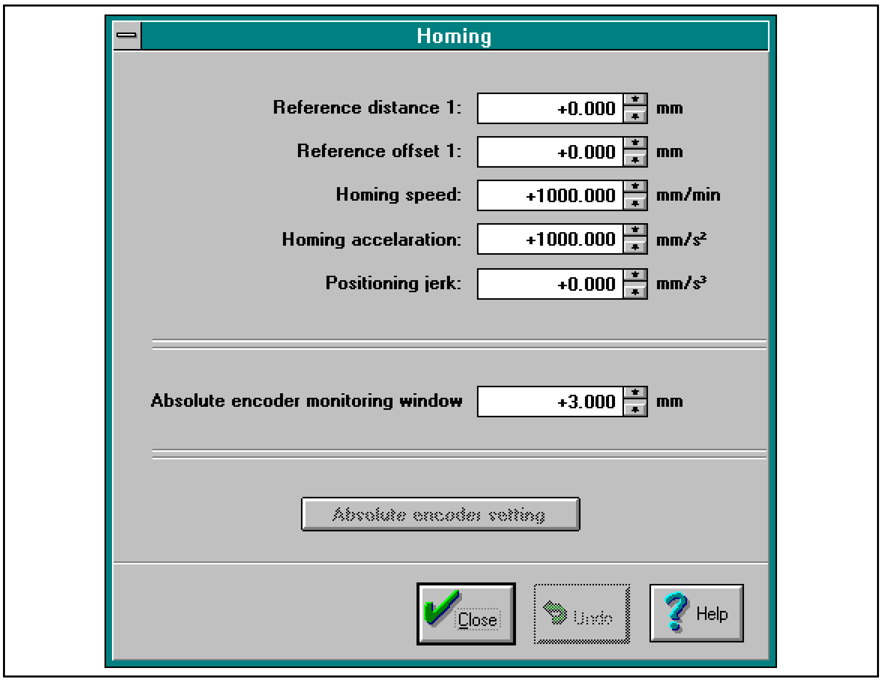


Fig. 10-40: Drive controlled homing procedure with a motor with integrated absolute encoderfunction

Setting the Absolute Position

The relationship to the machine mechanical system (the machine zero point) must be established when a axis is initially installed with a motor with an absolute value encoder (optional). This is done by following these steps:

- Move the motor to a position known in relation to the machine zero point either via the jogging function or manually.
- Enter the value in the **S-0-0052, Reference Distance 1** parameter which should be given as the actual position value of this known position.
- Enter 0 in the **S-0-0150, Reference Offset 1** parameter.
- Press the "Set Absolute Measure" button.

After the "**P-0-0012, Command 'Set Absolute Measurement'**" is executed, the current actual position value is set equal to the value which is entered in the **S-0-0052, Reference Distance 1** parameter, as long as the controller enable is currently deactivated. If the controller enable is active the calculation for accepting the homing position is made. The actual acceptance of the homing value in the actual position value occur only after the control enable is deactivated.

Moving Towards the Home Position

In the "Position Control with Step Motor Interface" operating mode it may be helpful to activate drive motion towards the home position via an external switching signal. Doing this makes executing a homing procedure for the stepping motor control unnecessary.

The velocity, acceleration, and jerk with which motion to the home position should be carried out can be entered via the appropriate homing motion parameters.

The drivedrive moves to the home position when the "NF" signal is set and the start signal is given. This requires that the control drive has been homed, or, in other words, that the "Set Absolute Measure" command has been successfully executed.

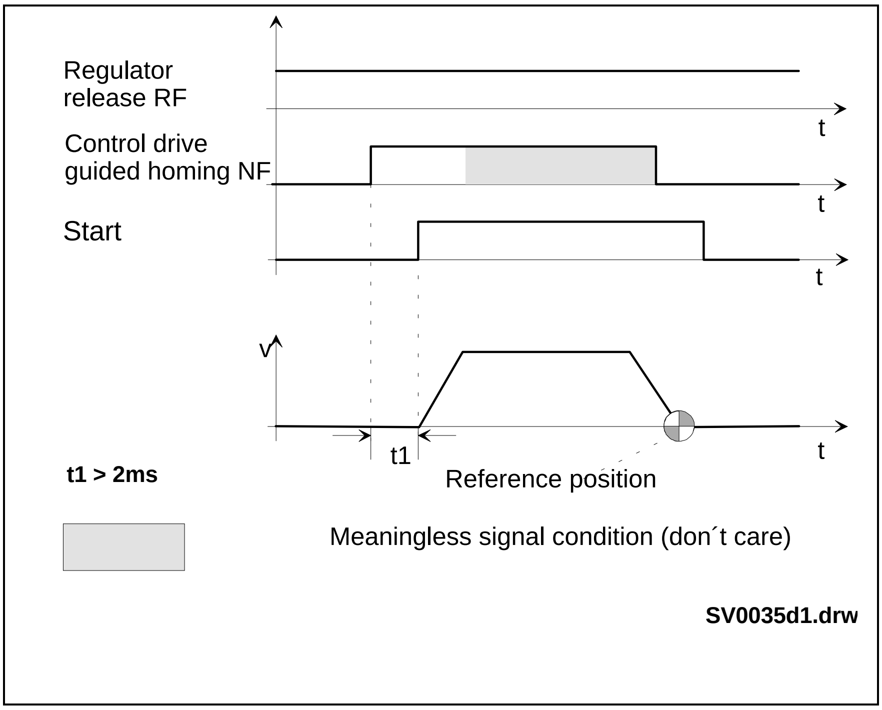


Fig. 10-41: Moving towards the home position

Absolute EncoderMonitoring

To ensure the safety of the absolute encoder function, the DKC has a monitoring system which can recognize errors in determining the absolute actual position value. The current actual position is saved when the DKC supply voltage is turned off. When it is turned on again the actual position which was saved is compared to the current motor position as read from the motor encoder. If the difference between the two position values is greater than the value entered in the **P-0-0097, AbsoluteEncoderMonitoring Window**" parameter, the error message **F276 Absolute Encoder Error** is given.

Different circumstances can trigger that absolute encoder monitor:

- The shaft was moved while the control drive was turned off.
- The motor encoder is showinga function error.

Setting the Absolute Encoder Monitoring Window

The value for the absolute encoder monitoring window must be determined specifically for each application. It should be selected such that possible movements of the shaft while the power is turned off are taken into account so that the monitor is not unnecessarily activated.

10.11 Jogging

It is possible to move the axis with the jogging function in operating modes "position control with step motor interface", "position control with positioning interface" and "speed or angle synchronization". The relevant parameters for the jogging function can be entered in dialog "jogging".

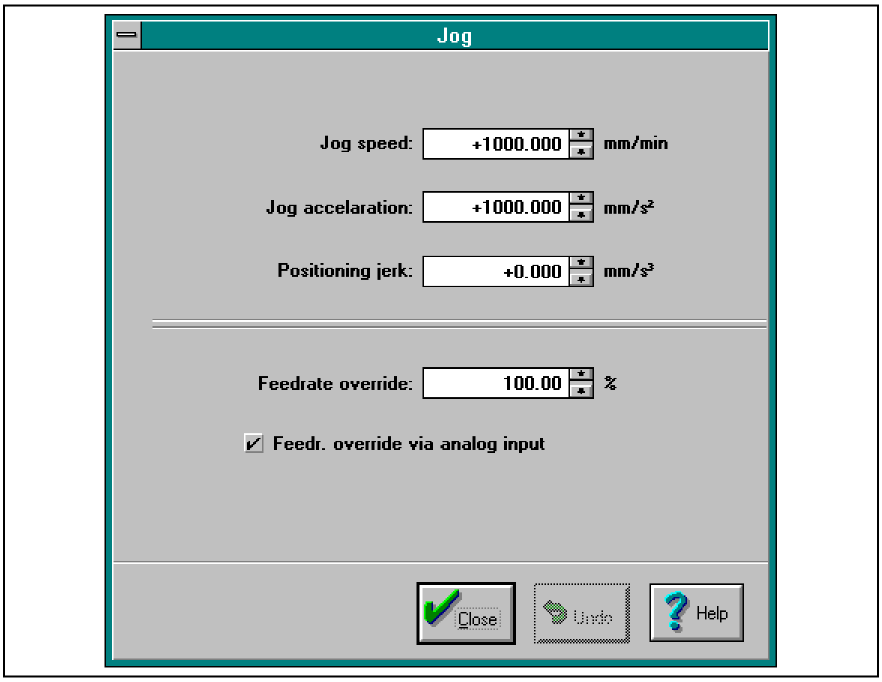


Fig. 10-42: Entering the jogging parameters

See also **P-0-4030, jogging velocity**

Jog+	Jog-	Drive	Display
0	0	standing	AH
1	0	moves forwards	JF
0	1	moves backwards	Jb
1	1	standing	AH

Fig. 10-43: Truth table for jogging mode

Note: The controls are status-controlled.

Jogging signal connection

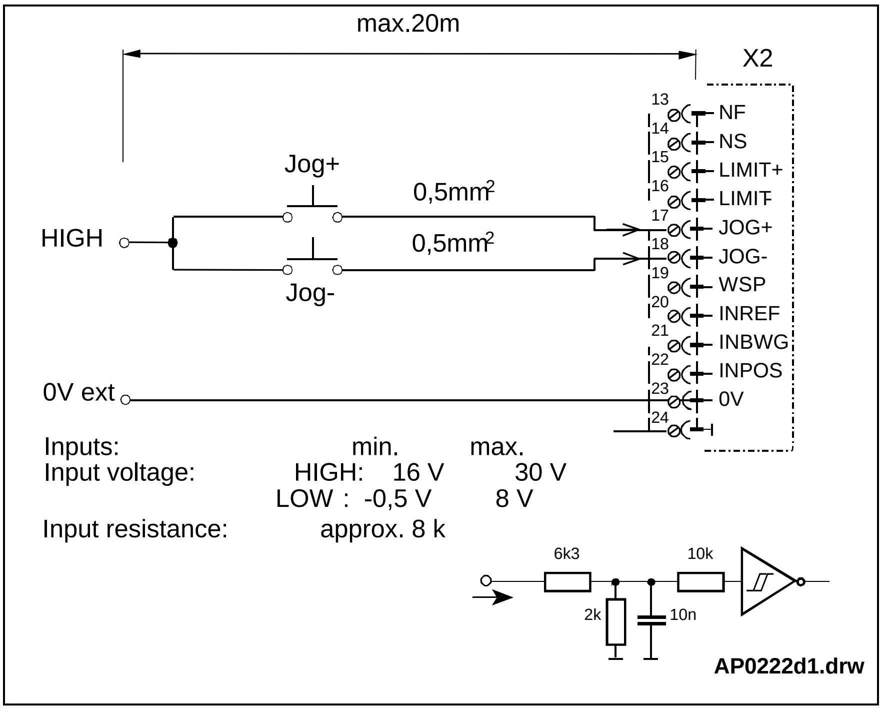


Fig. 10-44: Jogging signal connections

Jog mode behavior

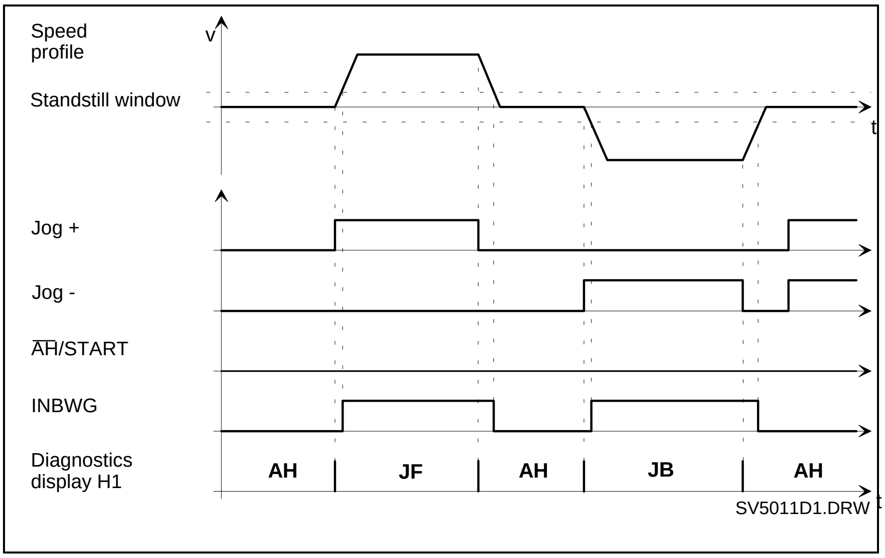


Fig. 10-45: Jog mode behavior

Override Feature While Jogging

Note: The speed at which the control drive moves while jogging can be controlled with the feedrate override function. The positioning with limit speed also immediately affects jogging speed.

Detailed information on this can be found in the chapter "Feedrate Override Function."

10.12 Feedrate Override Function

The velocity of the positioning sets, the homing velocity, and the jogging velocity are controlled by the feedrate override function. The "Feedrate override" parameter determines at what velocity, in proportional relation to the programmed velocity, the drive should move. In other words, at 100% the drive will move at precisely the programmed velocity.

A continuous reduction of the positioning velocity can be made via the analog command value input. To do this the "Feedrate-Override Variable via Analog Input" field must be activated. To convert the voltage ($U_{E1,E2}$) at the analog input use:

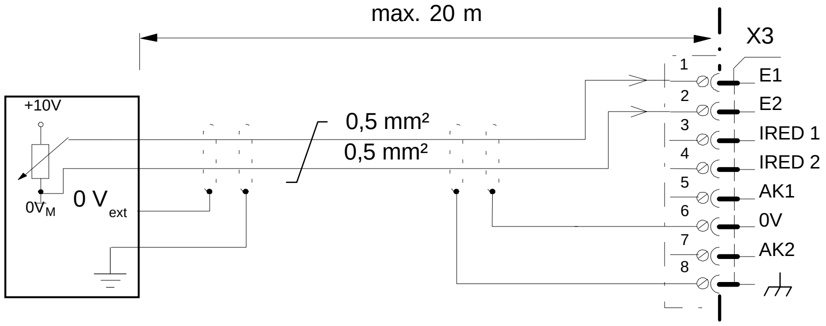
0Volt: Velocity = 0

10Volt: Velocity = the speed entered as maximum traversing speed

$$V = \frac{U_{E1E2}}{10V} * \text{Positioning speed}$$

Fig. 10-46: Speed

Connection of the Analog Override Signal



Inputs:

Inputs voltage	min.	max.
between IRED1-IRED2	±10 V	±15 V
between IRED1-0V; IRED2-0V	±10 V	±15 V
Input current: E1; E2	0,5 mA	
Input resistance	approx. 20 kOhm	
Input drift	18 µV/°C	
AD-converter	12 Bit	
Resolution per bit	4,8 mV	

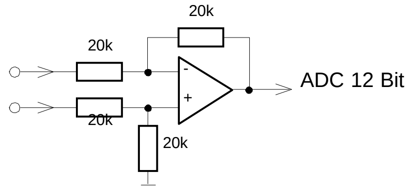


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Fig. 10-47: Connection of the analog override signal

10.13 Analog Output

DKC drives operate digitally. This means that all output variables are available as digital information from the DKC. The DKC has two analog diagnostic outputs to make velocity values, speed values, current values, etc. visible via an oscilloscope.

The selection of the output signals include the following values:

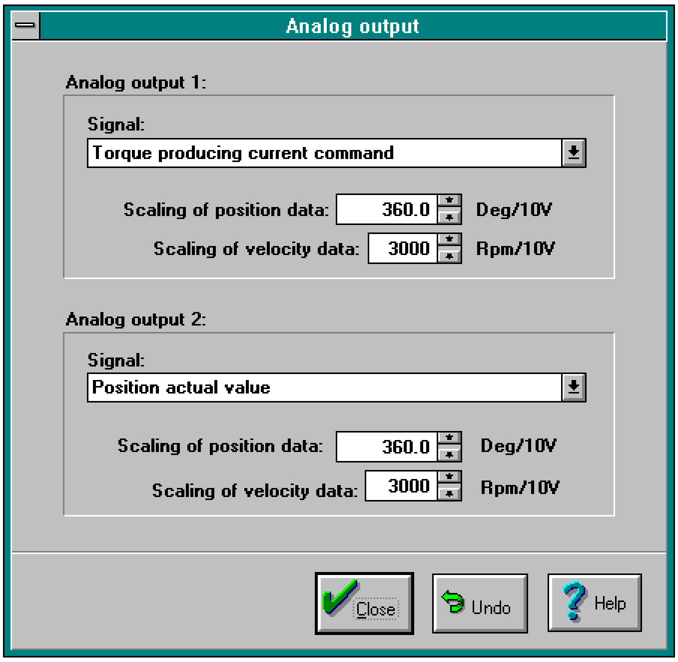
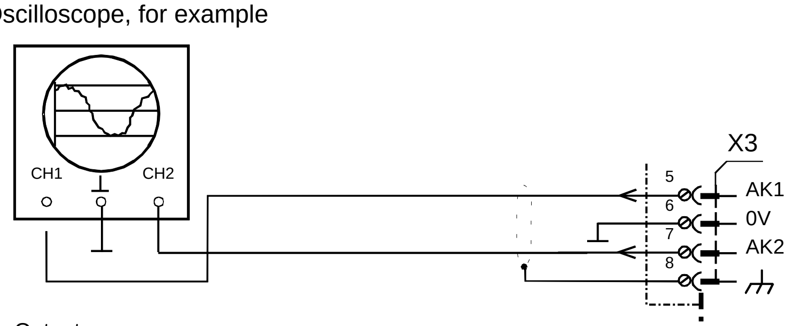


Fig. 10-48: Analog output

Number:	Selected signal:	Standard:
0x0	zero point	0V
0x1	torque generating command current	P-0-0136
0x3	S-0-0036, speed command value	P-0-0040
0x4	position command difference	P-0-0040
0x5	S-0-0051, actual position value 1	P-0-0042
0x7	S-0-0189, lag distance	P-0-0042
0x8	motor encoder with sinusoidal signal	1 : 1
0x9	motor encoder with cosine signal	1 : 1
0x12	torque-generating actual current	P-0-0136
0x13	actual magnetiziation current	P-0-0136
0X16	bleeder load	10V = 100%

Fig. 10-49: Selecting signals with analog output

Note: Velocity and position data always refer to the motor shaft! The scaleable output signals can reach overload if the scale is selected such that the current signal value exceeds the +/-10V limit. The exceeded value is emulated in the displayable (+/-10V) range and makes it possible to examine signals with a higher resolution.



Outputs:

Output voltage	min.	max.
AK1-0V; AK2-0V	- 10 V	+ 10 V
DA-converter	8 Bit	
Resolution per bit	78 mV	

AP0212d1.drw

Fig. 10-50: Illustration of the diagnostic output connection

10.14 Motor Brake

Servo axes must be secured against unwanted movement when the power is off if movement could cause damage.

INDRAMAT motors are available with optional integrated brakes. **ECODRIVE** DKC drive controllers have an integrated brake control.

Note: INDRAMAT motors have optional holding brakes, which are not designed to be operating brakes. Under closed use brakes become worn out after approx. 20000 motor revolutions. It is therefore important to pay attention to the proper function of a brake when installing a control drive with an integrated brake. Proper operation of the brake can be checked by a "clack-noise" when activating the control enable.

Connecting the Motor Brake

A regulated dc voltage is necessary for the brake's power supply. (24V / +-10%)

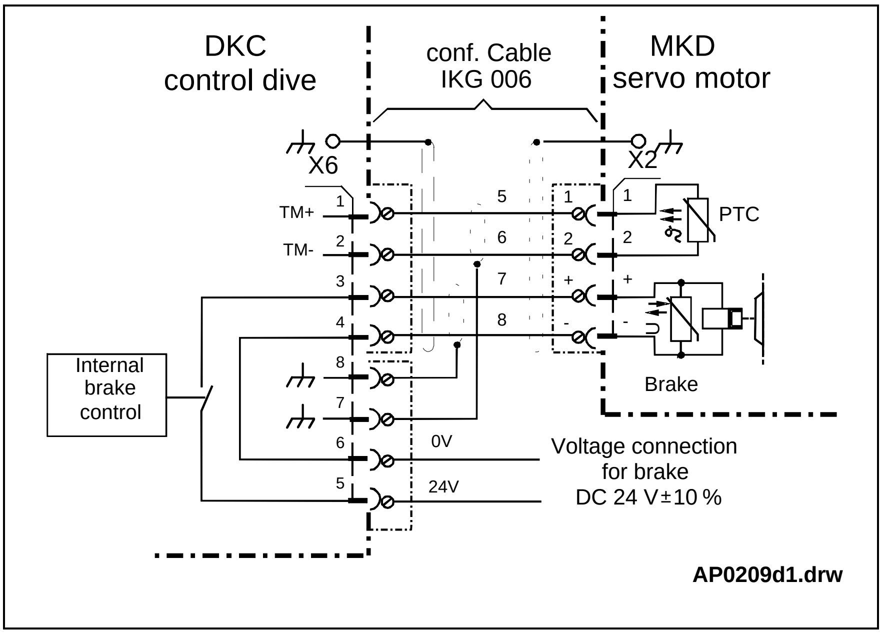


Fig. 10-51: Connecting the motor brake

Brake Reaction After Switching Off the Control Enable and in Error Conditions

The brake is controlled via the drive controller. The diagrams below show the chronological reaction of the brake control after the control enable is turned off and in error conditions.

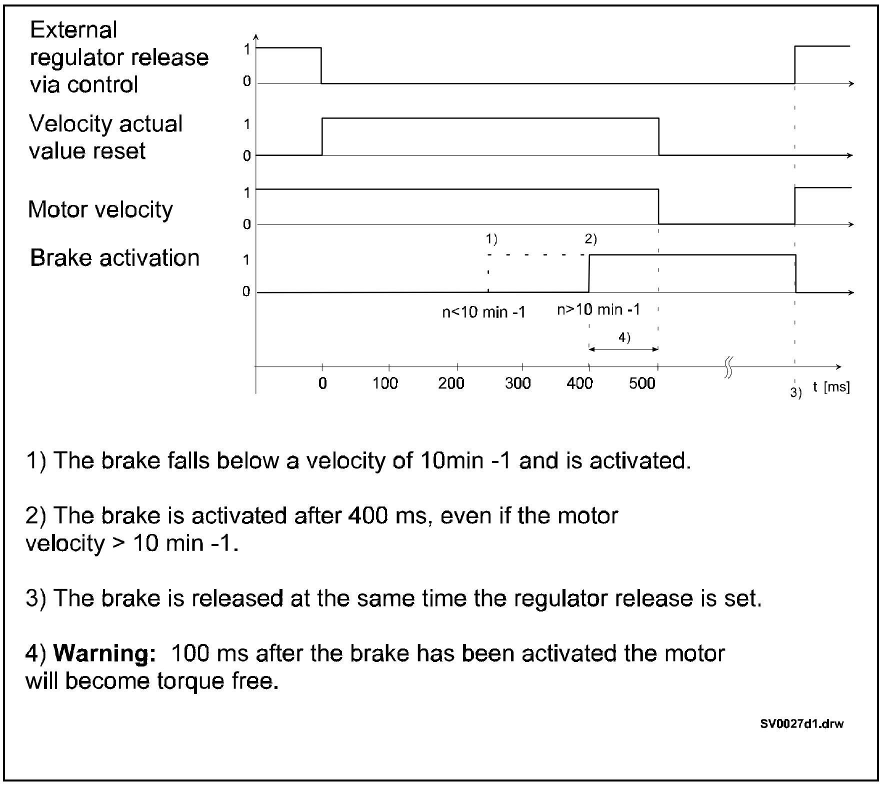
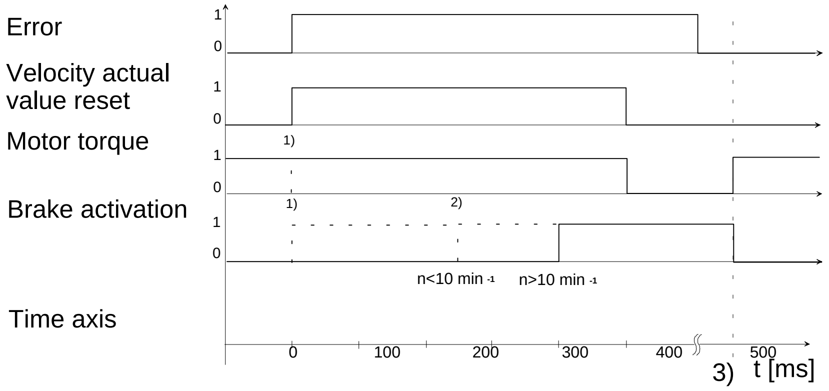


Fig. 10-52: Brake: Reaction after removal of the control enable



1) The brake is activated when error reaction 1 is set.

2) Error reaction:
The brake falls below a velocity of $10 min^{-1}$ and is activated.
The brake is activated after 400 ms, even if the motor velocity > $10 min^{-1}$

3) After the cause of the error is eliminated, the brake will release when the regulator is released.

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Fig. 10-53: Brake: Reaction in error conditions

10.15 Activating the Drive

Controller Enable

The drive is activated via the controller enable signal.

Requirements for Activating the Drive

The drive must be ready for operation and the power supply must be turned on for the drive to be activated. (Condition display: "Ab")

If the controller enable is set while missing the power supply, the control drive will register **F226 Undervoltage Error**.

Drive enable after error reaction:

After the drive enable has been remmoved or after a fatal error has occurred, the drive enable cannot be switched back on until the programmed error raction has been runthrough and accepted.

Example:

Drive enable on after error reaction "Speed command value goes to zero":

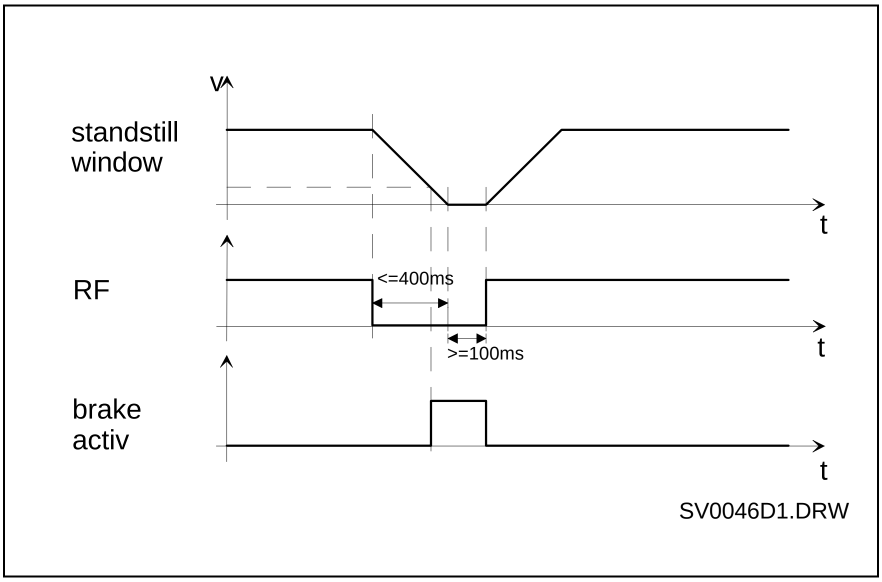


Fig. 10-54: Speed command value to zero

Example:

Drive enable signal applied after error reaction "torque to zero":

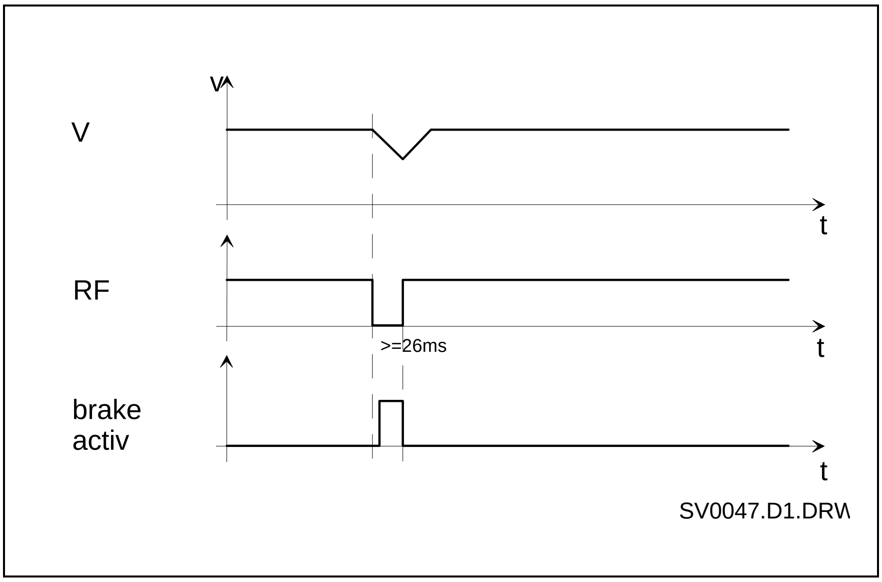


Fig. 10-55: Torque to zero

Drive Stop / Start

Drive Stop / Start in Velocity and/or Torque Control With Analog Command Value

If the drive stop signal is active (0V on X4/3) the drive will not follow the analog command value and will instead remain in velocity control with velocity command value = 0. If the drive is in motion when the drive stop is activated, the controlled braking will be applied with maximum torque until the drive reaches standstill.

If the drive stop signal is not active (24V on X4/3) then the drive will follow the analog command value on X3/1...2.

Start in position control with step motor interface and with synchronization modes

If the drive stop signal is active (0V on X4/3) the drive will not follow the stepping signal and will instead stay in position control at the current position. If the drive is in motion when drive halt is activated, then the motor brakes to a standstill at the deceleration rate which has been parametrized.

Parameters **S-0-0138, bipolar acceleration limit value** and **S-0-0193, positioning jerk** determine the delay.

When the drive stop command has been given the drive can still be moved via the jogging inputs. (X2/17...18).

If the drive stop signal is not active (24V on X4/3) then the drive will follow the stepping signals on X2/1...4.

Drive Stop / Start During Positioning Operation

If the drive stop signal is active (0V on X4/3) then the drive will remain in position control at the current position. If the control drive is in motion when the drive stop is activated, then drive controlled braking will be applied with maximum torque until the drive reaches standstill.

Parameters **P-0-4007, process block velocity** and **P-0-4008, process block acceleration** determine the delay.

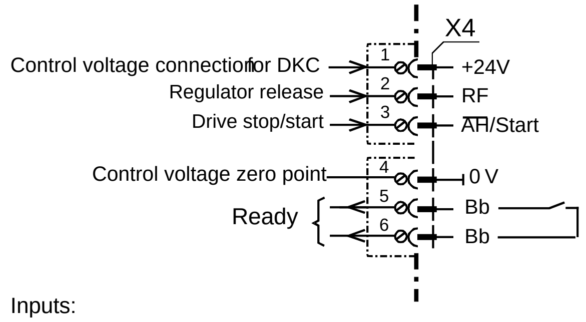
When the drive stop command has been given the drive can still be moved via the jogging-inputs. (X2/17...18).

When the start signal is activated the previously selected positioning set is started.

Drive Stop / Start During a Drive Controlled Homing Procedure

If the drive controlled homing procedure signal is activated (24V on X2/13) and the start signal is activated afterwards (24V on X4/3) then the drive will execute its internal homing procedure.

Control Enable and Drive Stop Connections



Inputs:

Input voltage	min.	max.
HIGH	16 V	30 V
LOW	-0.5 V	8 V
Input resistance	approx. 8 kOhm	

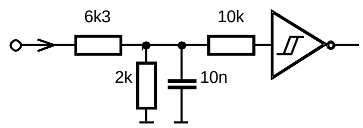


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Fig. 10-56: RF and AH / Start connections

11 Serial Communication

11.1 General Information for Serial Communication

The DKC01.1/DKC11.1 contains one serial interface. Parameter and diagnostic information can be exchanged through this interface. The interface can be operated alternatively in either **RS232 mode** or in **RS485 mode**.

Note:	An ASCII protocol is used for communications. ⇒ The number of bytes to be transmitted is different from the data length in the parameter description (internal numeric format).

11.2 Communication via the RS232 Interface

The RS232 interface is intended for connection port to a PC with the DriveTop startup program. A maximun cable length of 15m is possible.

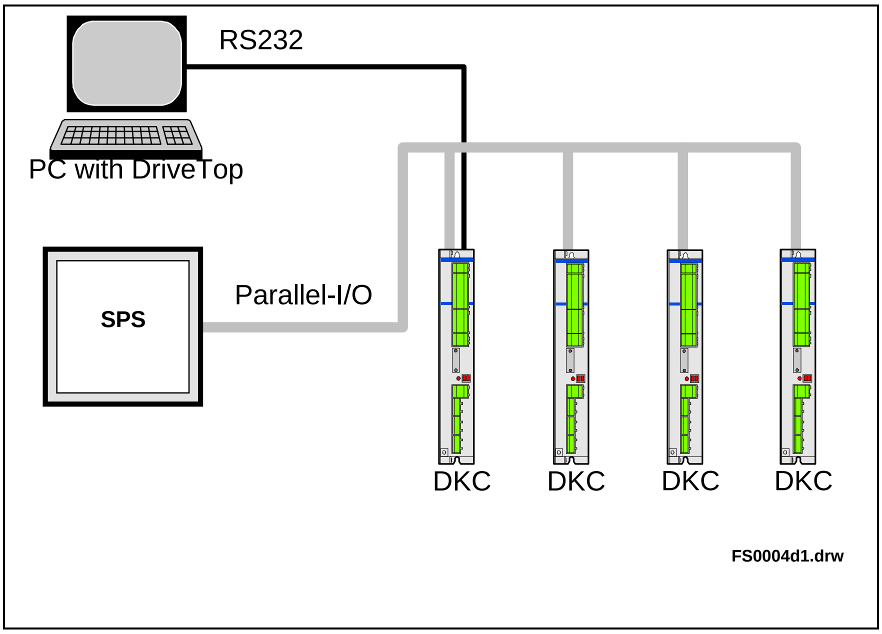

Fig. 11-1: Communication over the RS232 Interface

Features:

- transmission rates: 9600 and 19200 baud
- max. transmission path: 15m
- 8-bit ASCII protocol
- no parity bity
- on stop bit

Type of data exchange via RS232

- parameters
- commands
- diagnoses

11.3 Communication over the RS485 Interface

Communication over the RS485 interface allows the realization of a serial bus with the following specifications :

- Up to 31 drives can be connected with a bus master.
- Transmission rate: 9600 and 19200 baud
- Maximum cable length : 500m
- Half duplex operation over 2 wire transmission line
- 8-bit ASCII protocol
- no parity bit
- no stop bit

Type of Data Exchange over RS485:

- Parameters
- Commands
- Diagnostics

Operation of Multiple Drives with DriveTop

Operational Advantages:

- Startup of multiple DKCs without reconnection of interface cable.(Central parameterization and diagnostic connection)
- Realization of a central PC supported visualization unit

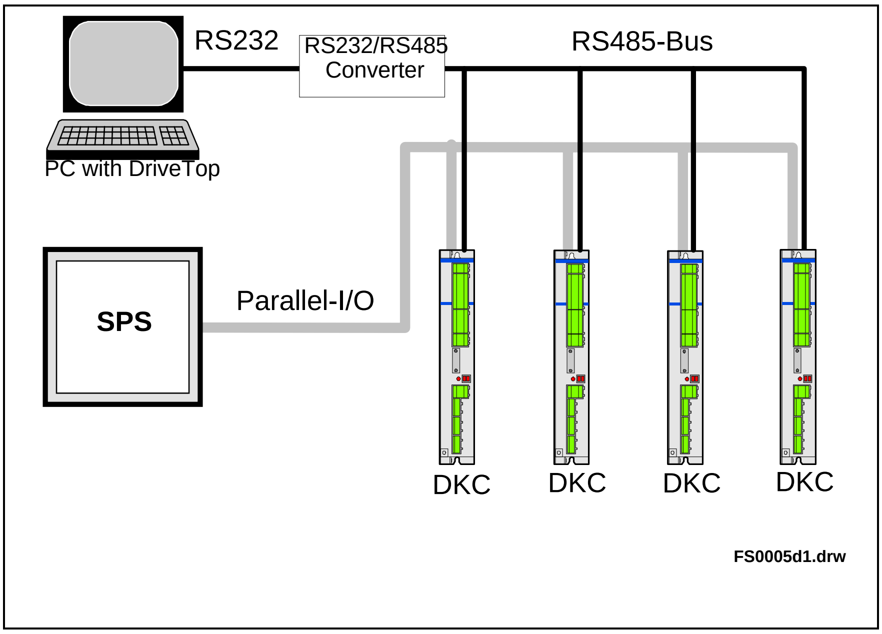

Fig. 11-2: Operation of Multiple Drive with DRIVETOP

Parameterization and Diagnostics via a SPS (PLC)

Operational Advantages:

- Changing of parameters is possible via a PLC. (for example the adaptation of the positioning commands)
- Expanded diagnostic possibilities for the PLC through processing of the error codes.

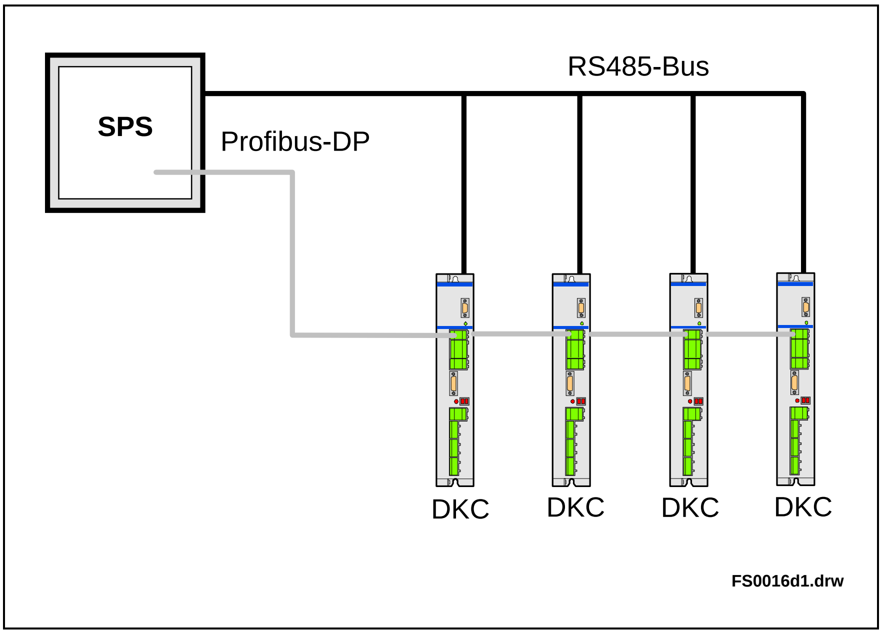

Fig. 11-3: Parameterization and Diagnostics over a SPS

Parameterization and Diagnostics for Drive Group through the Operator Interface

Operational Advantages:

- Implementation of a central visual display unit

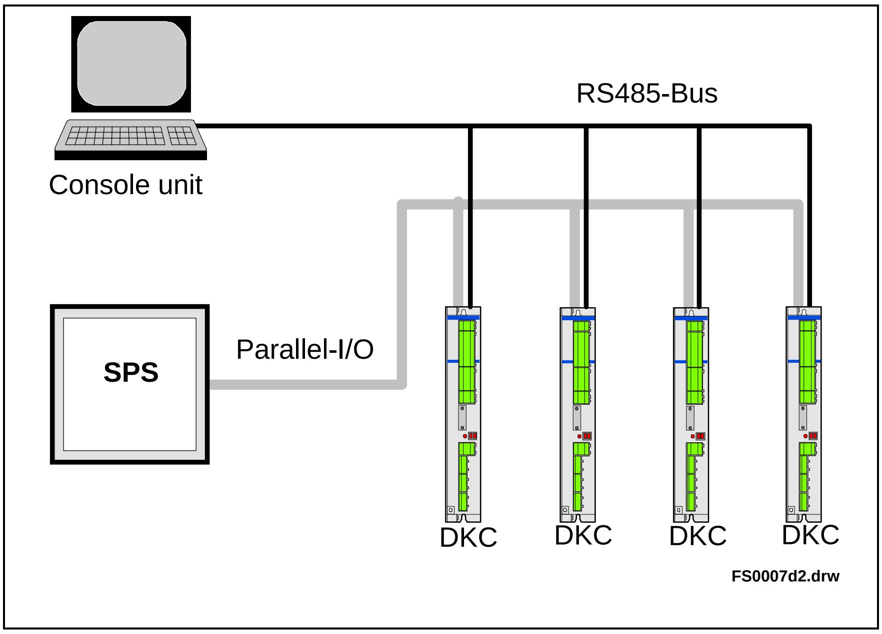

Fig. 11-4: Parameterization and diagnosis of the drive group through a control unit

11.4 Communications settings

Communication Parameters

The data exchange over the serial interface is controlled with three parameters:

- **P-0-4022, drive address**
- **P-0-4021, baud - rate (RS232/485)**
- **P-0-4050, delay answer RS232/485**

P-0-4022 Drive Address

If multiple drives are connected over the RS485 interface, then the data exchange must be organized through the allocation of drive addresses to the individual units on thebus.

The parameter P-0-4022 establishes the address where a drive can be contacted. There are admissible addresses from 1 to 99.

With the use of the RS232 interface, an explicit setting of the drive address is not required because in this case only one drive at a time can be connected to the interface.

ATTENTION

If several axes are to be switched via RS485,

⇒ then make sure that the drive address is set so that only one drive is connected to the serial bus.

P-0-4021 Baud Rate

The baud rate of the serial interface is set by parameter . The following settings are possible:

0 : 9600 Baud

1 : 19200 Baud

ATTENTION

⇒ All the drives on the bus must be set to the same baud rate.

P-0-4050 Answer Delay

The RS485 interface operates in half duplex mode. The direction of the data must be switched during the data exchange. The switch of the data direction happens in less than half of one millisecond for the DKC units. In order for the connected terminal devices (PC or SPS) to be given enough time for the data direction switch to occur, the answer delay/PLC time of the drive can be set in this parameter.

The entry is in ms. The maximum setting is 200ms.

The default value for the answer delay is set at 20ms at the manufacturer. From past experience most PC’s will operate without any problems with this setting.

If communication problems occur , for example a "TIMEOUT” message in DriveTop, then the value for the answering delay can gradually be set to a larger value until there are no more problems occurring. For a safe margin , the limit value so determined should be multiplied with 1.5 and then entered as the answering delay value.

Setting of the Drive Address

In the case where the communication occurs over the RS485 bus, then each of the bus communication devices must be provided with a unique bus address. In order to avoid access conflicts, each drive address must be used only once.

Note: The drive address in the DKC is set via the serial interface by writing into communications parameter **P-0-4022, drive address**. DriveTop or a PLC can be used for this purpose.

Original State after Establishing the Control Voltage

After turning on the control voltage, all drives conntected over the RS485 bus of the are in the "passive mode".

With the passive mode, there is no possibility of communication. In order to reach the active mode, a drive must be targeted and contacted through a "change drive" command.

11.5 Communications procedure

Parameter Structure

All parameters of the drive controller are stored in a stamdard parameter structure. Each parameter consists of 7 elements. The table below defines the individual elements and the access possibilities. The following sections will reference the each diagrammed parameter structure.

Element-No.	Data Block Element	Access Possibilities
1	ID number	Read
2	Name	Read
3	Attribute	Read
4	Unit	Read
5	Min. input value	Read
6	Max. input value	Read
7	Operational datum	Read / Write

Fig. 11-5: Parameter Structure

Note: There is a parameter description with detailed specifications of the qualities of all the operational parameters in Appendix A.

Communication with a Specific Unit on the Bus

In order to establish communication with a unit on the bus, a CHANGE DRIVE command must be issued with the target to the specific drive address on the bus. With each CD command, the contacted drive will be activated and all other drives will be switched into the passive mode. The contacted drive reports with its prompt. From this point the communication continues with the activated drive until communication is switched to another drive through a subsequent CHANGE DRIVE command.

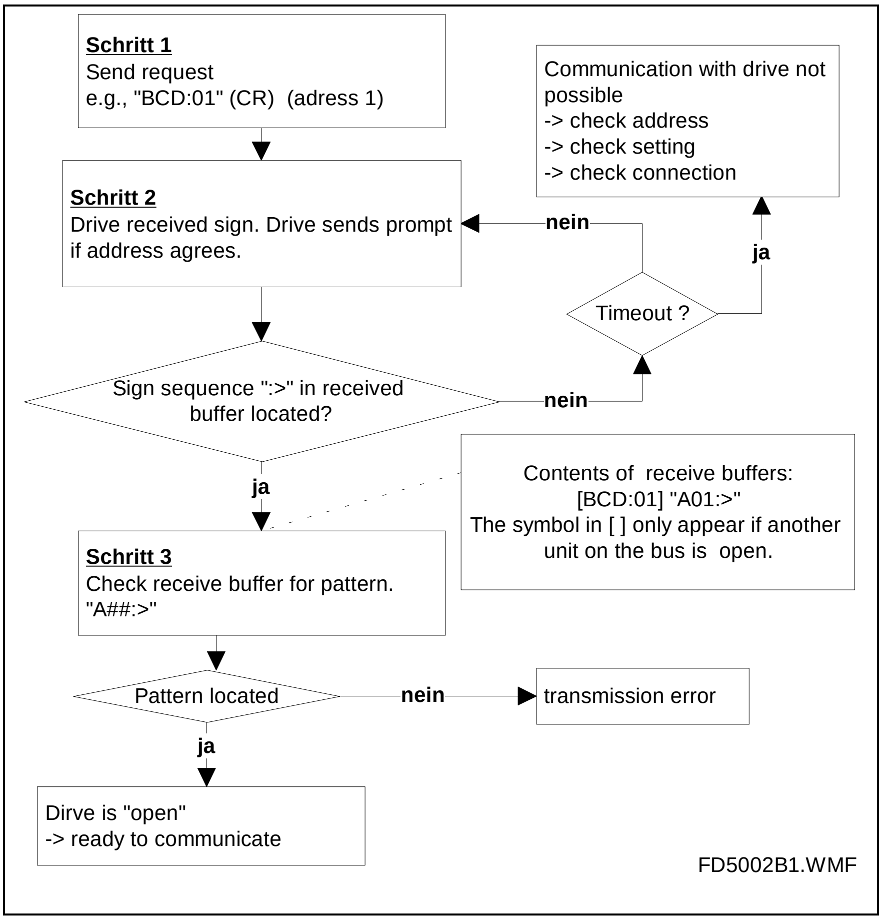

Fig. 11-6: Bus participant actuated

Writing To a Parameter

Writing to a parameter is allowed generally in the following manner:

ID number of the parameter, data block element number, w, operational datum (Carridge Return)

After a completed writing operation, the unit responds again with its prompt.

For example, in order to write to the datum value of the parameter P-0-4037, the following input is required:

Note The data entered must correspond to the data type set in the attribute (HEX, BIN; DEC).

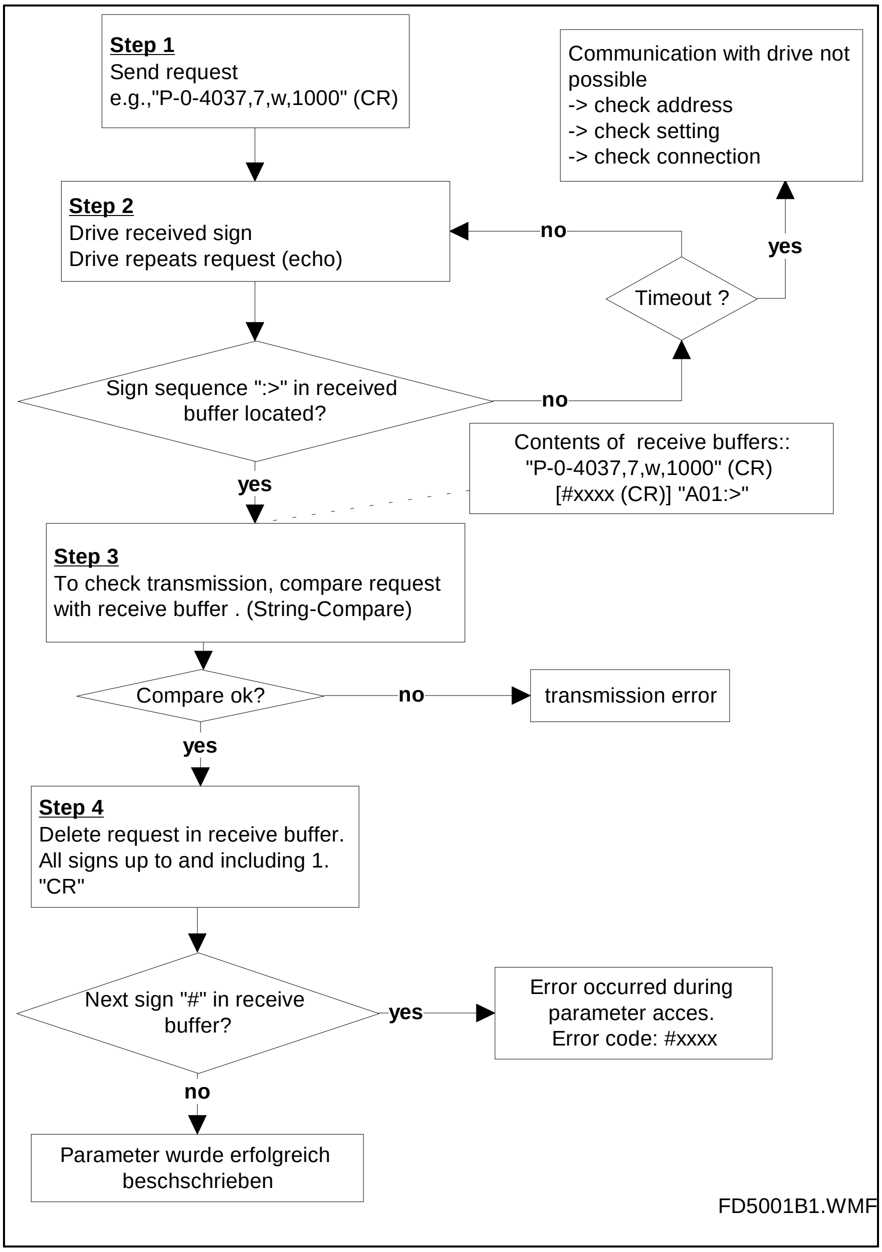

Fig. 11-7: Write accessing a parameter

See also error messages

Reading of a Parameter

The general form for reading a parameter is as follows:

ID number of the parameter, data block element number, r (Carridge return)

The drive responds with the contents of the contacted data block element again.

For example, in order to access the operating data of the parameter P-0-004, the following input is required:

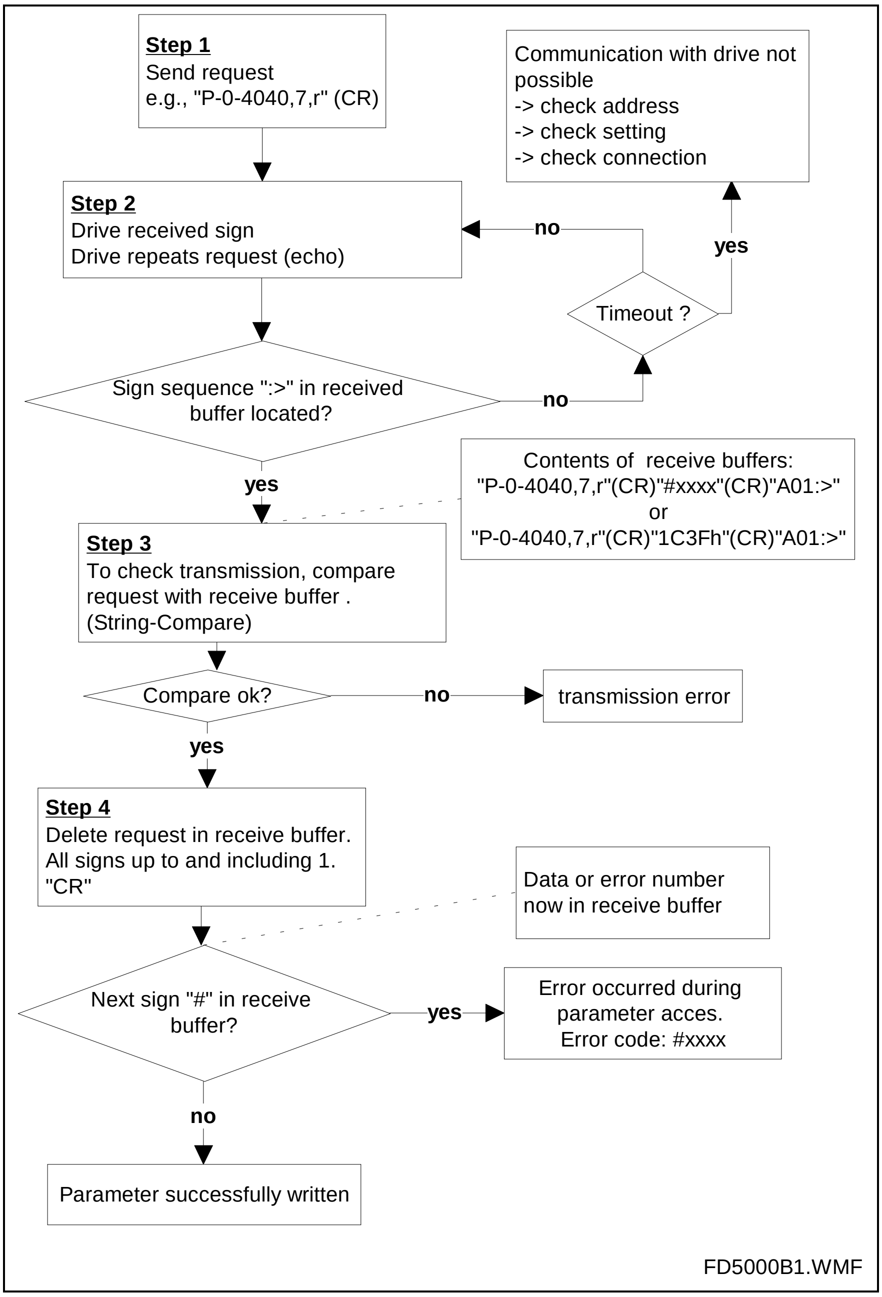

Fig. 11-8: Read accessing a parameter

Writing to a List Type Parameter

There is a series of list type parameters in the drive. These lists are written to in a modified manner.

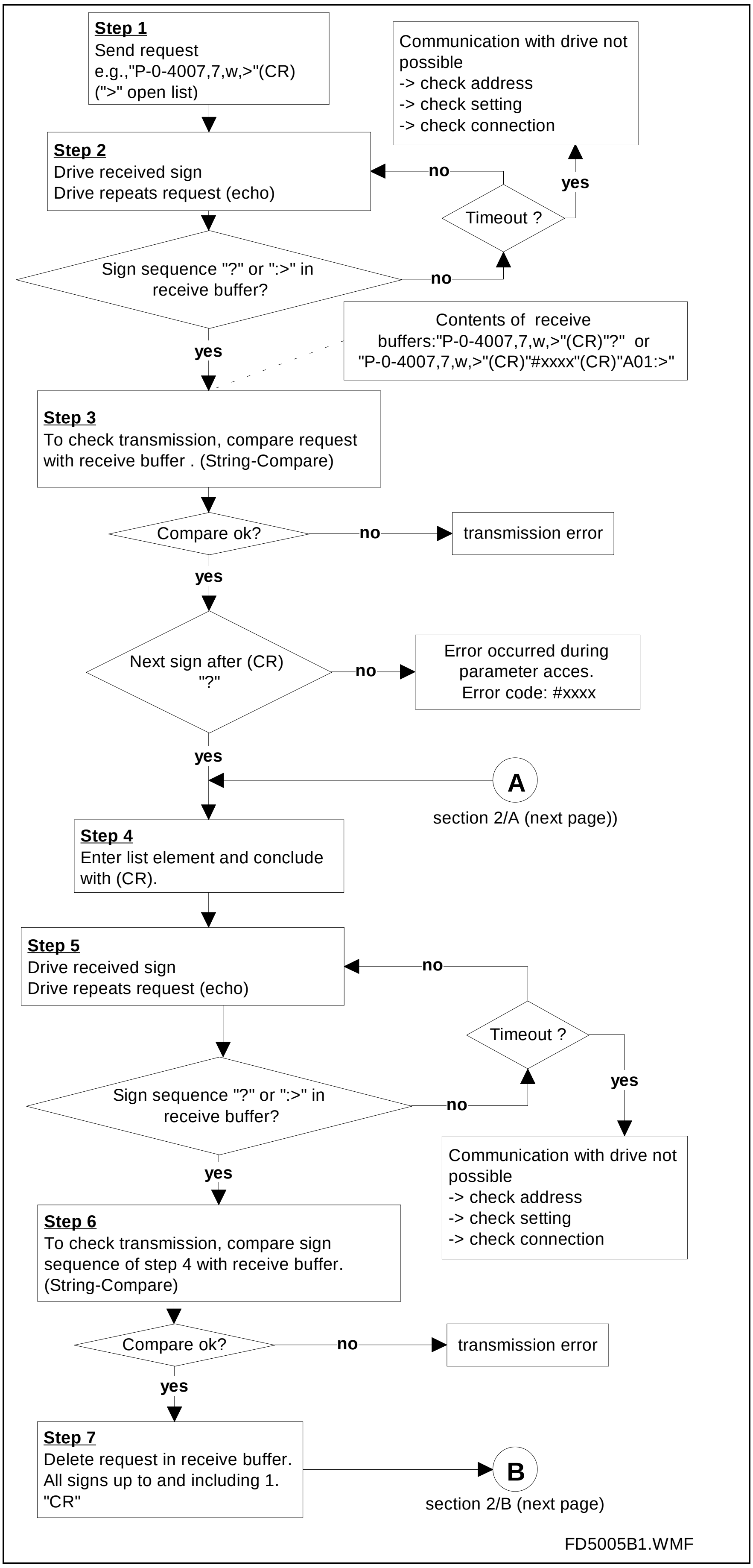

Fig. 11-9: Write accessing list parameters (part 1)

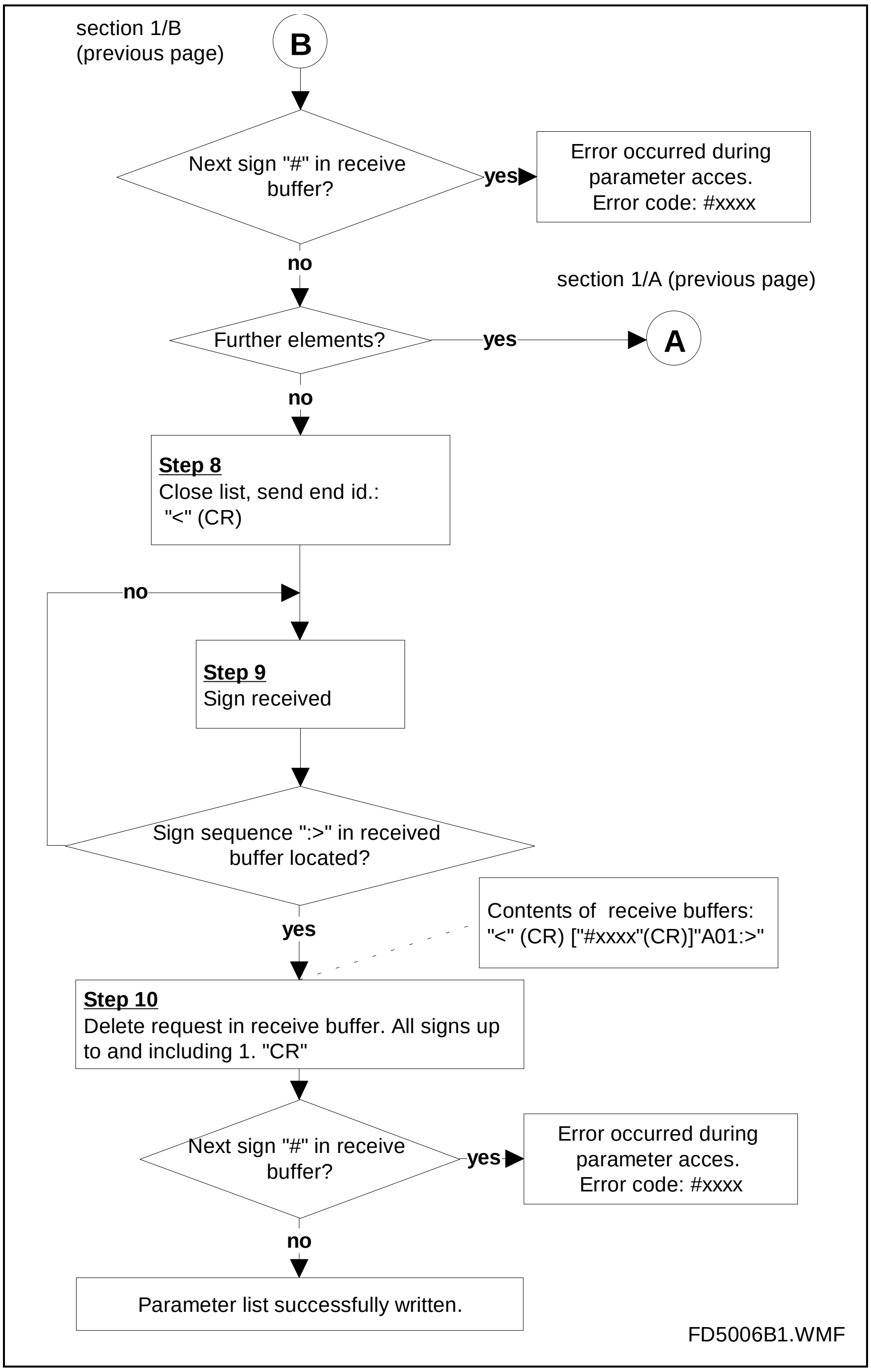

Fig. 11-10: Write accessing list parameters (part 2)

It is important that the input is terminated with the "<“ symbol, only then will the data be wrtten to the drive.

Reading a List Type Parameter

Reading a list parameter is done in the same manner as with a normal parameter. The drive responds, however, with an answer of all the list elements.

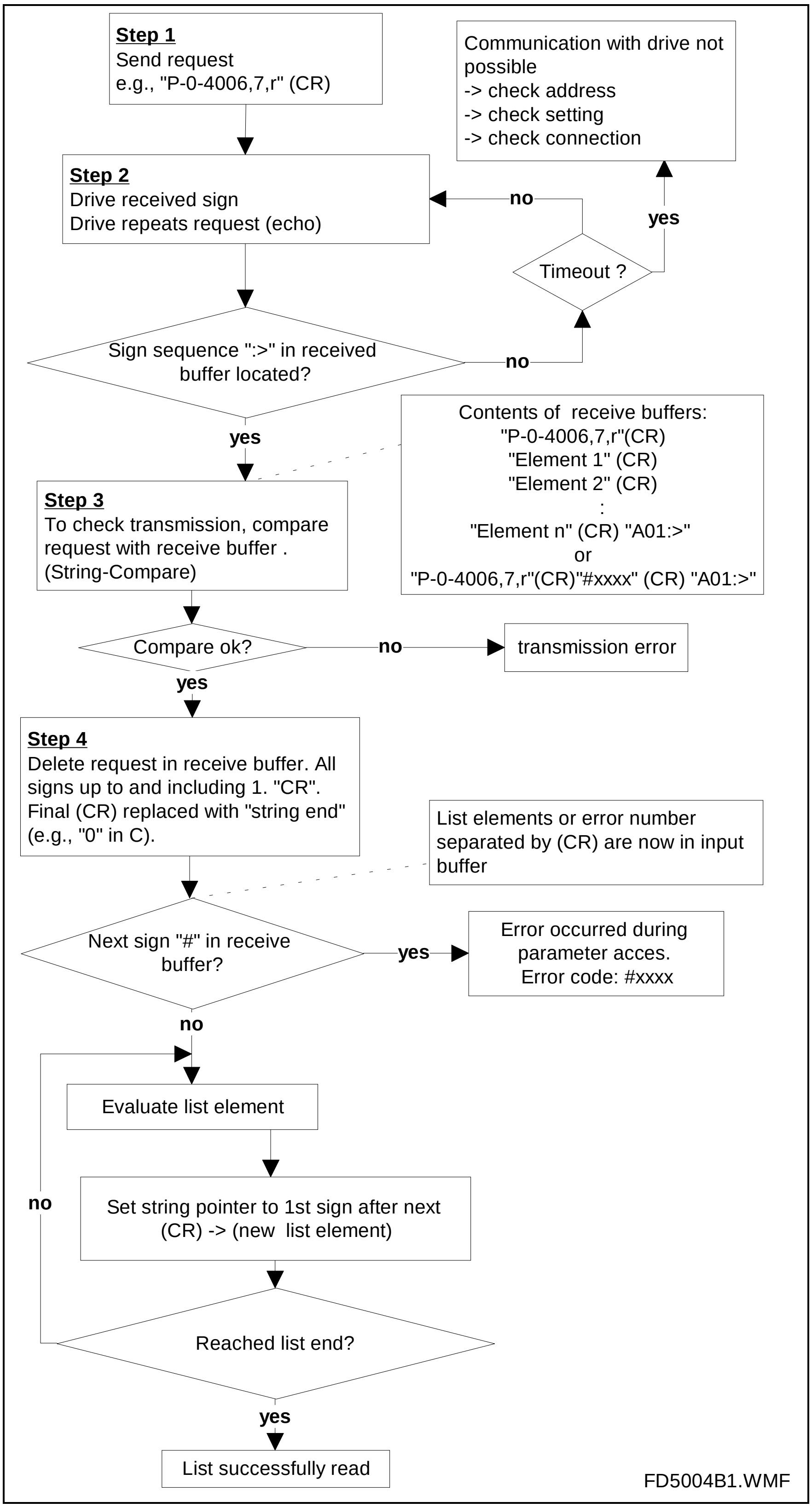

Fig. 11-11: Read accessing list parameters

Executing Parameter Commands

With the DKC, a series of commands can be processed. The execution of commands happens automatically within the controller. There are commands for the following:

- **Changing from operating to parametrization mode S-0-0127, C1 communication phase 3 transition check S-0-0128, C2 communication phase 4 transition check P-0-4023, C4 command: switch to parameter mode**
- **S-0-0262, command basic load**
- **S-0-0099, C5 reset class 1 diagnostic**
- **S-0-0148, C6 drive controlled homing procedure**
- **P-0-0012, command 'set absolute measurement'**
- **P-0-4032, C3 command set emulation absolute value**

A command can be started, interrupted or ended over the serial interface. Over thisinterface the status of the command status can be set.

The general form for executing a command is as follows:

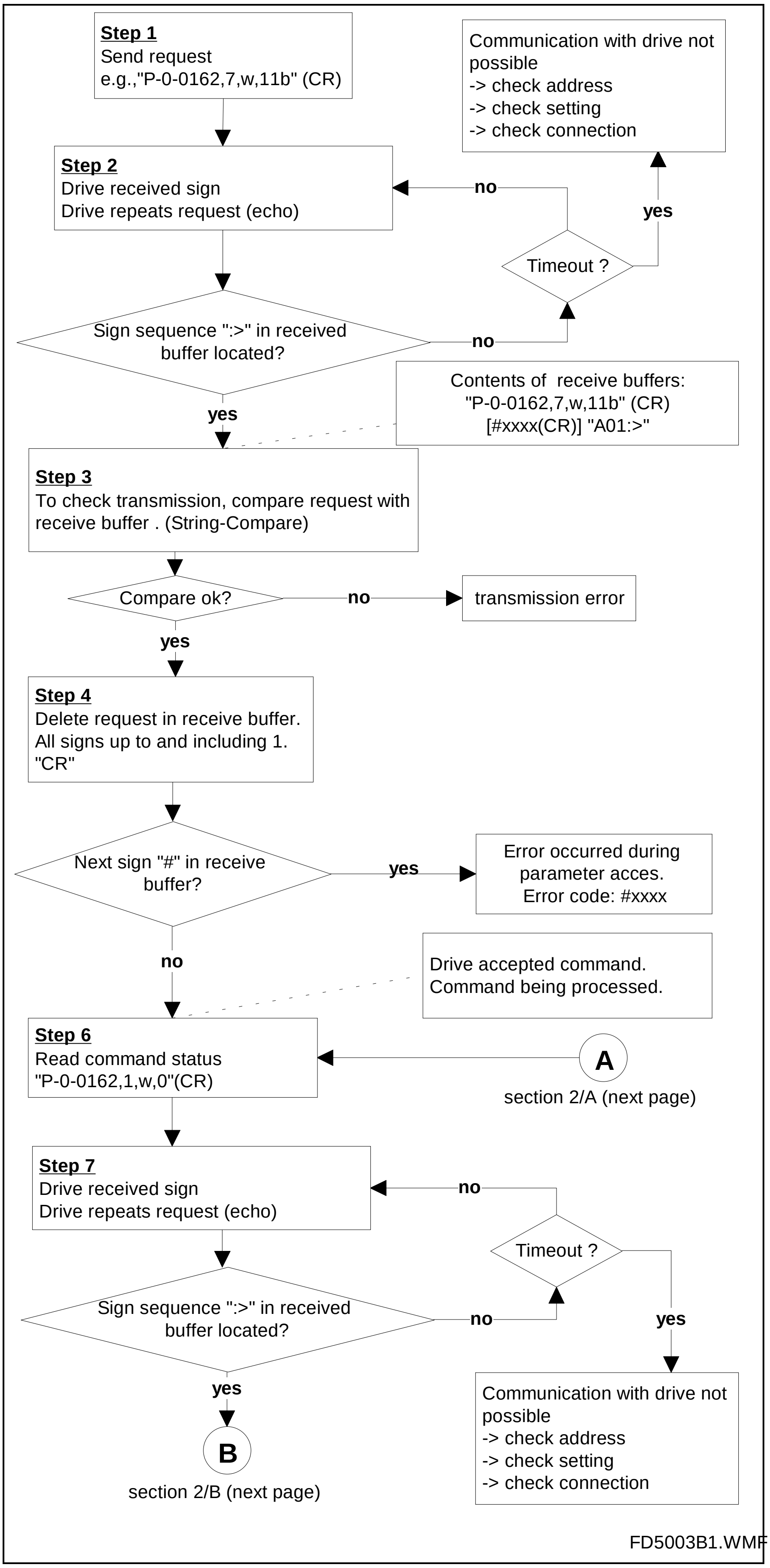

Fig: 11-12: Triggering a command part 1

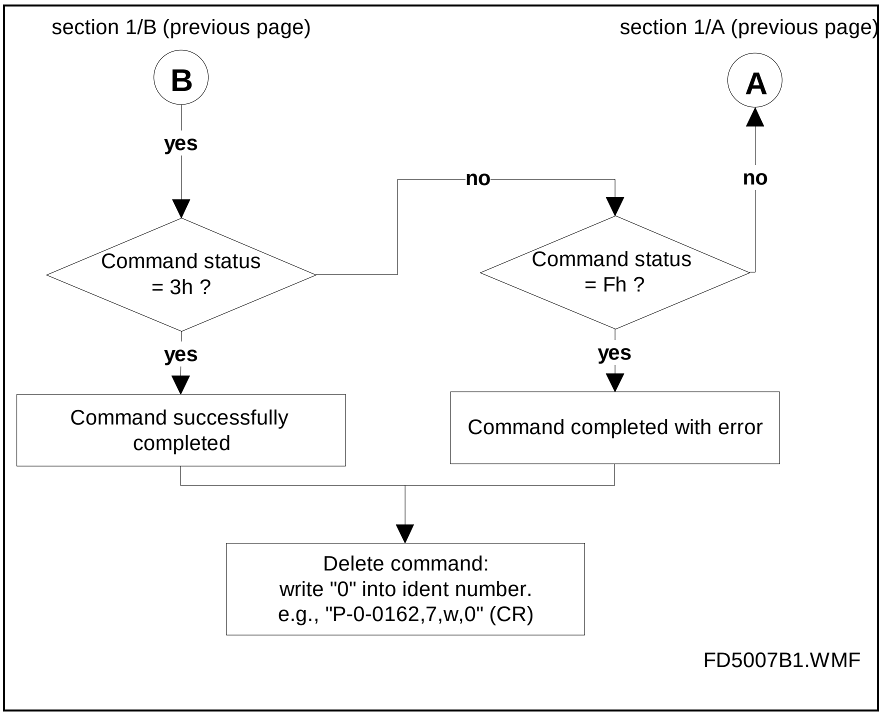

Fig. 11-13: Triggering a command part 2

Requesting the Status of Commands

The actual status of a command can be requested. Using the request for the command status is especially important when it is necessary to establish that the driving side of the command process is completed before the connected control (or the PC) ends a command.

The general form for requesting the status of a parameter command is as follows: A01:> ***ID number of the parameter, 1, w, 0 (Carridge Return)***

The drive responds to the request to write to the ID number of the command parameter by returning the actual command status.

Possible status messages:

0 h	command not set in drive
1 h	command set in drive
3 h	command set, released and properly executed
5 h	command set and released in drive
7 h	command set and released, but not yet executed
F h	command set and released but not yet executed, therefore an error

Fig. 11-1: Status messages

The command status will be transmitted in the form of a bit list. The meaning of each bit is displayed below.

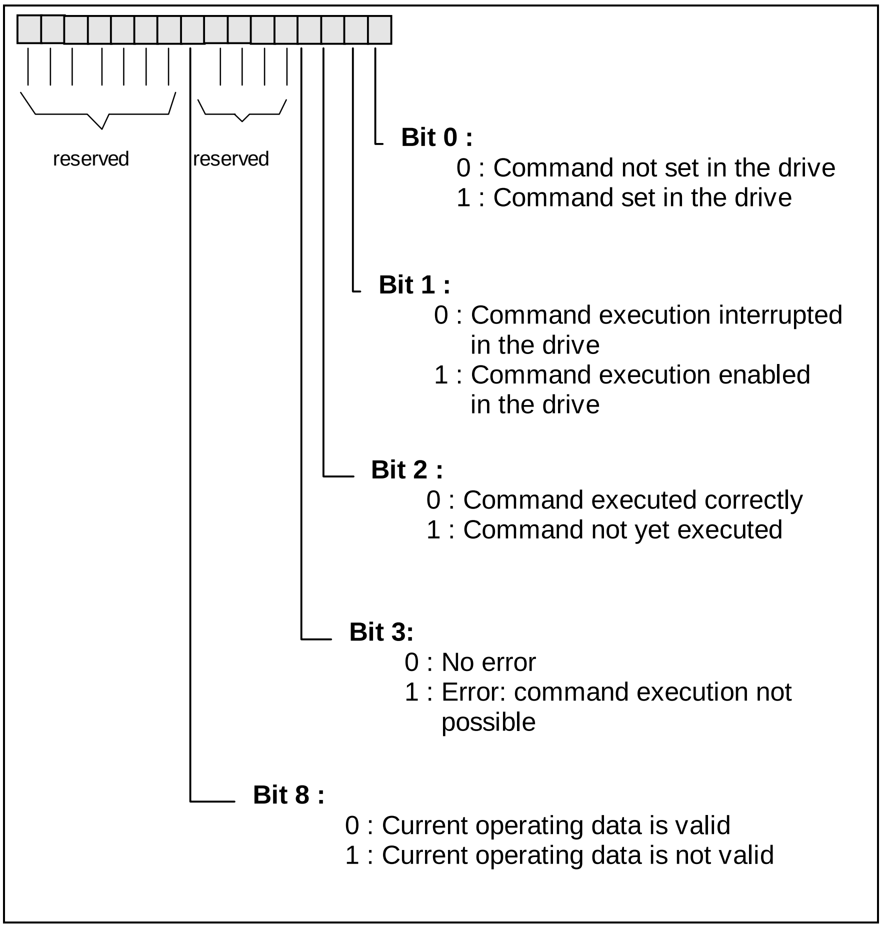

Fig. 11-14: Command reception (data status)

Ending a Parameter Command

The general form for ending a parameter command is as follows:

ID number of the parameter, 7, w, 0 (Carriage Return)

Error Message

If illegal parameter access is attempted or for example writing access to a read only data block element is attempted an error message is issued by the drive.

List of the possible error codes

Error code:	Error description:
#1001	ID number missing
#1009	Invalid access to element 1
#2001	Namemissing
#2002	Transmitted name is too short
#2003	Transmitted name is too long
#2004	Name cannot be written to
#2005	Name is currently not editable
#3002	Transmitted attribute is too short
#3003	Transmitted attribute is too long
#3004	Attribute is not changeable
#3005	Attribute is currently write protected
#4001	Unit missing
#4002	Transmitted unit is too short
#4003	Transmitted unit is too long
#4004	Unit is not changeable
#4005	Unit is currently not changeable
#5001	Min. value missing
#5002	Transmitted min. value is too short
#5003	Transmitted min. value is too long
#5004	Min. value is not changeable
#5005	Min. value is currently not changeable
#6001	Max. value missing
#6002	Transmitted max. value is too short
#6003	Transmitted max. value is too long
#6004	Max. value is not changeable
#6005	Max. value is currently write protected
#7002	Transmitted datum is too short
#7003	Transmitted datum is too long
#7004	Datum cannot be written to
#7005	Datum cannot currently be written to
#7006	Datum < min. value
#7007	Datum > max. value
#7008	Datum is not correct
#9001	Input is not identifiable
#9002	Parameter type error
#9003	Invalid data set number
#9004	Invalid data block number
#9005	Data element number is not defined
#9006	Error in read-write recognition (r/w)
#9007	Invalid character in the data

11.6 Operation Example

Changing of the Positioning Command Data

Assumption:

- Multiple drives are connected over a RS485 interface to a SPS/PLC. The currently entacted has the address 1.
- The drive functions in positioning made It will use 4 positioning blocks.
- The target positions of the positioning block data should be changed over the RS485 interface.

Initiating communication to the desired axis

BCD:01 (CR) Command for Switching to Drive **A01:>**
Response of the contacted drive.
All other drives function in passive mode.

Note: There is not a signal reflection, instead the drive transmitts the complete input sequence back after reception of the CR.

The resident memory mode deactived

Normally the parameter will be stored through writing in a EEPROM so that the data remains after the supply voltage is turned off.

If the application would require to proceed with frequent changes of the parameters during operation, for example the changing of the target position of positioning data sets, there is a danger of eventually exceeding the maximum allowable number of writing cycles of the EEPROM. In order to avoid this possibility , the resident memory must be turned off.

Turning off of the resident memory mode must be done after each time the power supply of the connected controller is turned on and is valid until the next time the power supply is turned off. While non-resident mode is active, all parameter data is written to Ram memory only.

Turning off the resident memory: S-0-0269,7,w,1 (CR)

Writing the List of the Target Positions in the Drive

The target positions of all the axes are stored in the form of a list in the parameter **P-0-4006, process block target position**. In order to change one or more of these values, all of the relevant values of this list must be written. If four target positions will be used, then all 4 positions must be written even if only one of the positions should be changed.

Drive reaction:	**Input:**	
	P-0-4006,7,w,> (CR)	
?	*100.0 (CR)*	Target position command 0
?	*200.0 (CR)*	Target position command 1
	etc.	
?	*<(CR)*	
A01:>		

Immediately after writing to the target positions, the new values in the drive are active.

11.7 Connection techniques

Application example RS 485 - communications with DriveTop

ECODRIVE is standardly equipped with an RS 485 interface. To operate DriveTop with multiple ECODRIVEs, an RS232/485 converter between PC and drives is needed.
The following example illustrates a proven construction with RS485-connection using a PSM-EG-RS232/RS485-P/2D converter from Phoenix Contact.

PSM-EG-RS232/RS485-P/2D Interface Converter

The PSM-EG-RS232/RS485-P/2D interface converter from Phoenix Contact implements an interface conversion to a type that satisfies both the industry and can be mounted into the control cabinet.

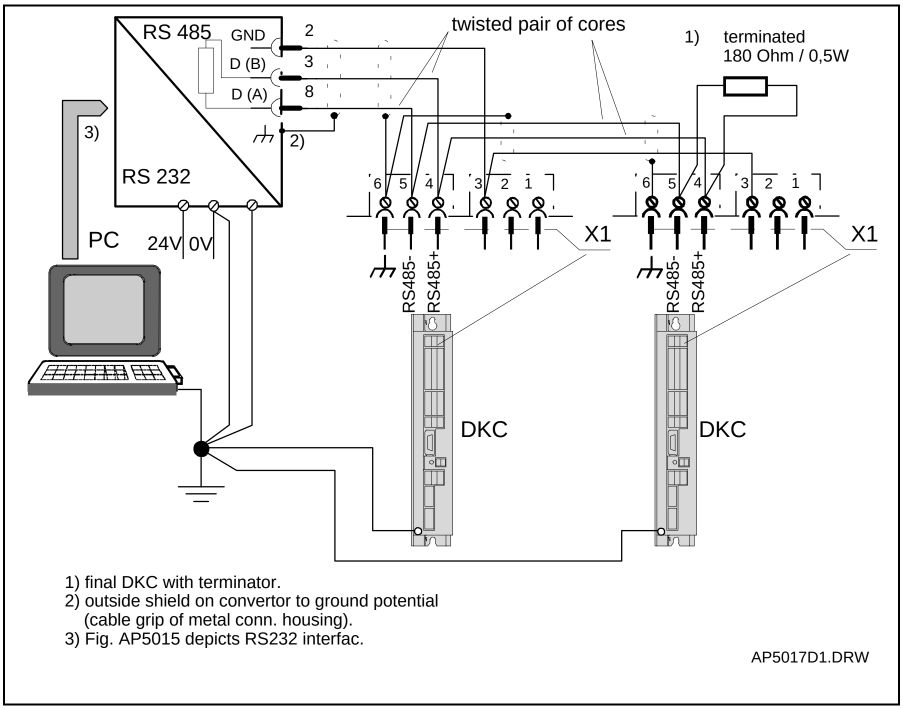

Fig. 11-15: RS 485 - connecting multiple DKCs

- maximum number of drives on the bus 31
- maximum cable length 500 meters
- line termination resistance 2 x 180 Ohm

Note: The cable connection from unit to unit may not be star-shaped but rather wired from DKC to DKC.
The RS485 interface cable requires a terminator resistor at both ends. The terminator resistor (180 ohm) integrated into the converter and the pullup and pulldown resistor (470 ohm each) must be activated. The other end of the line must also be terminated with 180 ohm / 0.5 W resistance. The resistor is directly connected to the DKC, connector X1, pins 4 and 5.

Switch poition in interface converter

The converter can be adapted to various peripherals via specific switch positions.

The switch positions demonstrates here must be used for the following wiring diagrams.

- Switch RS485 to **ON**
  ⇒ 180 ohm line terminator and 470 ohm pullup and pulldown are on
- Switch RS232 to **DTE** (data terminal equipment)
  Data direction change for RS 485 via RTS
  ⇒ Pin 2: TxD, pin 3 RxD,
- Jumper connection set from 3 to 4
  Polarity of dat direction changeover
  ⇒ Send mode: signal to RTS +3V to +15V
  ⇒ Receive mode: signal to RTS -3V to -15V

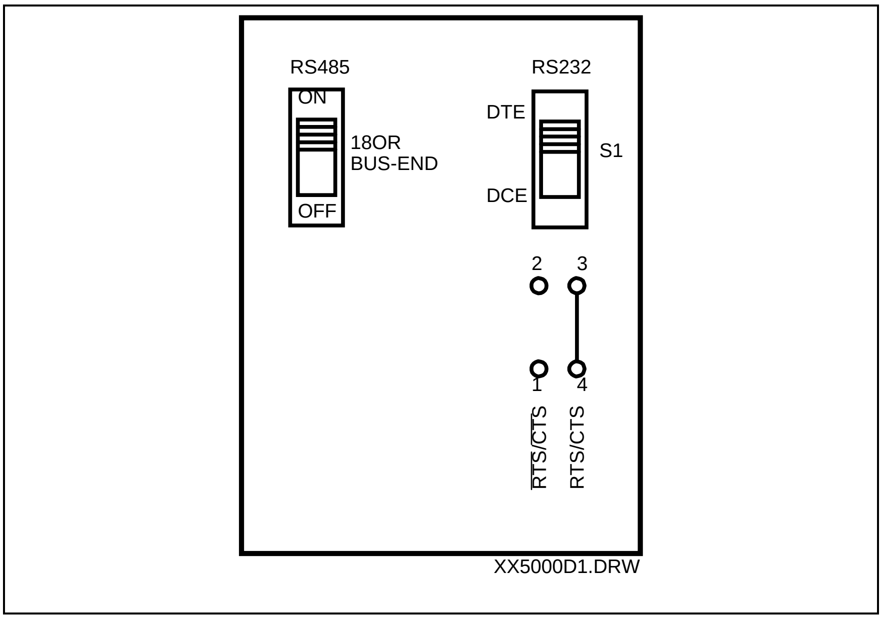

Fig. 11-16: Switch position / jumper position in interface converter

Connecting the RS232 of the PC to the interface converter

The interface converter must be connected via a 9 pin D-subminiature plugin connector to prevent interference.

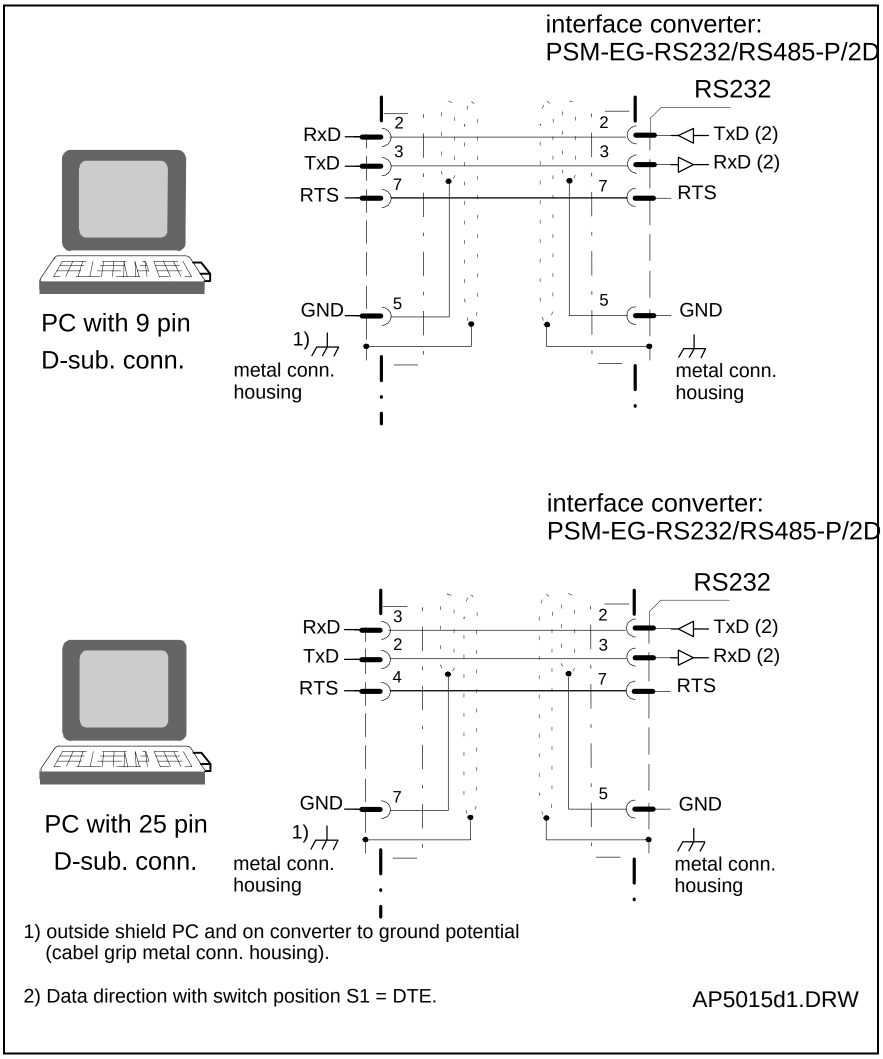

Fig: 11-17: RS 232 cable (PC - interface converter)

Connecting the RS485 of the interface converter to the DKC

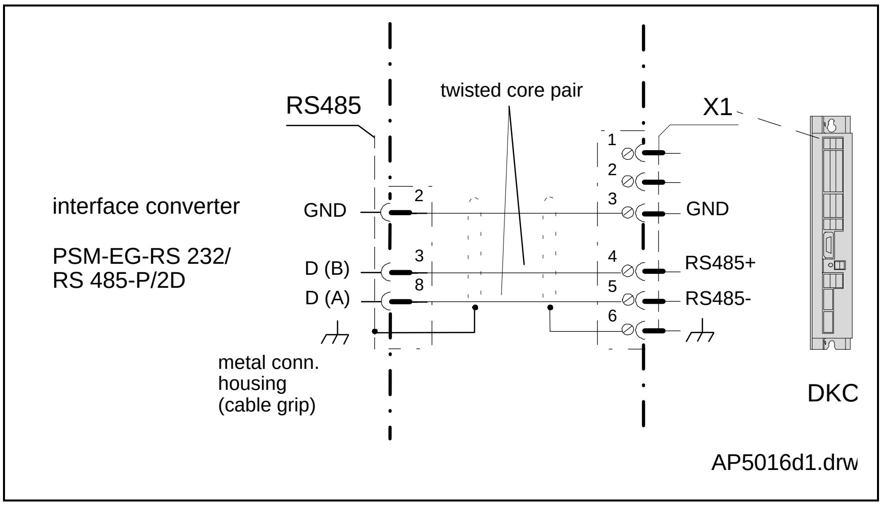

Fig. 11-18: RS 485 cable (interface converter - DKC)

RS 232 Connection

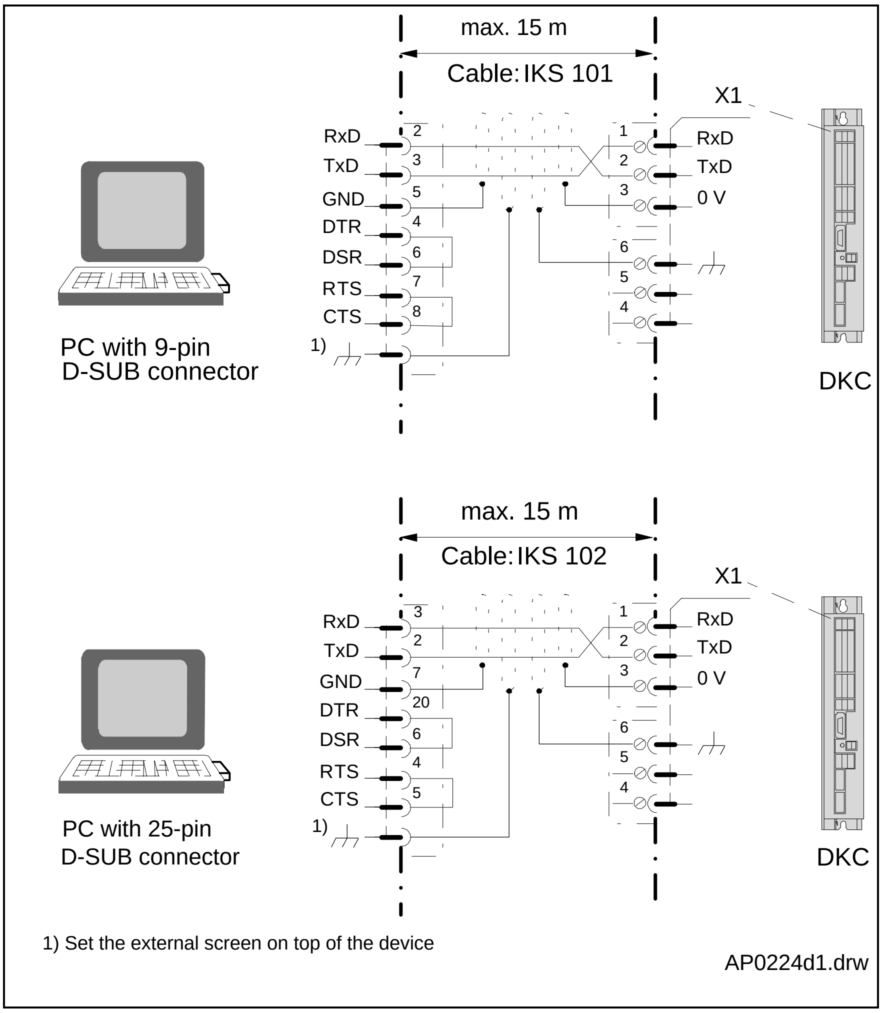

Fig. 11-19: RS 232 Connection

Note: Only point to point connection with maximum cable length of 15mis possible, the PC and drive controller unit must share a common central ground.

Notes

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ECODRIVE
DCK01.1/DKC11.1 Drive Controllers

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Contents

Notes

1 General Information

Structure of this Document

All standard and product-specific parameters are listed in this chapter in ascending numerical order.

It supplements the entries made in the Functional Description and represents a complete description of all parameters used in the ECODRIVE product.

Note: The parameter description is especially important if the serial interface (RS485/232) from the drive controller is used. Detailed knowledge of the definition of each parameter is not needed for using DriveTop to set parameters during installation.

The description of the individual parameters breaks down as follows:

1) General description

Parameter functions and definitions and aids to assist in parametrization are summarized in this section.

2) Attribute descriptions

This includes the list of charcteristics and characteristic values used in the classification of parameters. These are needed to complement parameter descriptions. If only a quick summary of their importance is needed, then these are not relevant.

Definitions

The following abbreviations are used:

Data length:

2Byte - the length of the operating data is 2 bytes

4Byte - the length of the operating data is 4 bytes

1Byte variable - this is operating data of variable length (list), the length of a single data element is 1 Byte

2Byte variable - this is operating data of variable length (list), the length of a single data element is 2 Bytes

4Byte variable - this is operating data of variable length (list), the length of a single data element is 4 Bytes

Format :

BIN - operating data should have a binary display format

Note: Leading zeros of BIN Format data are not transmitted via ASCII strings over the RS232/485 serial interface nor displayed in DriveTop. For example, the datum value 0000, 0000, 0011, 1011 would be transmitted and displayed as 11,1011.

HEX - the display format for the operating data should be hexadecimal

DEC_OV - the display format for the operating data should be decimal without a sign

DEC_MV - the display format for the operating data should be decimal with a sign

ASCII - the operating data is an ASCII string

IDN - the operating data is an ID number

Edit:

no - the operating data can not be edited

P2 - the operating data can only be edited in communication phase 2

P23 - the operating data can only be edited in communication phase 2 and 3

P234 - the operating data can be edited in any communication phase

P3 - the operating data can only be edited in communication phase 3

P4 - the operating data can only be edited in communication phase 4

Memory :

fixed - operating data is programmed in the drive

no - operating data is not buffered in the drive; the value after turning on the drive controller is not defined.

Param.E²prom - operating data is buffered in the E²prom parameter (IC2 on the drive controller main circuit board).

Ampl.E²prom - operating data is buffered in the E²prom from the drive controller.

Feedb.E²prom - operating data is buffered in the E²prom from the motor feedback data memory. (only for MDD- and MKD motors)

The following parameter operating data are stored in the motor feedback:

- P-0-0018
- P-0-0508
- P-0-0509
- P-0-0510
- P-0-0511
- P-0-0512
- P-0-0513
- P-0-4014
- P-0-4005
- P-0-4037
- P-0-4038
- P-0-4039
- P-0-4042
- P-0-4047
- P-0-4048
- S-0-0109
- S-0-0111
- S-0-0113
- S-0-0116

Validity check:

no - operating data will not be checked for validity

Phase2 - operating data will be checked in the command "Communication phase 3 transition check"

Phase3 - operating data will be checked in the command "Communication phase 4 transition check"

Extreme value check:

no - operating data will not be checked for extreme values when written to

yes - operating data will be checked for extreme values when written to

Combination check:

no - the operating data will not be checked (bitwise)for valid combination with other paramter values when written to

yes - the operating data will be checked (bitwise) for valid combination with other parameter values when written to

Cyc. transmittable :

only in SERCOS devices

Default Value:

The default value indicates the value of the parameter loaded into fixed memory with the current version of firmware installed on the drive following the PL program load command and prior to user edits or loading saved parameter files.

2 Standard parameters

S-0-0014, Interface Status

Description:

The current communication phase can be requested through the first three bits (0, 1, 2).

2 The drive is in parameter mode
4 The drive is in operate mode

Structure of the parameter:

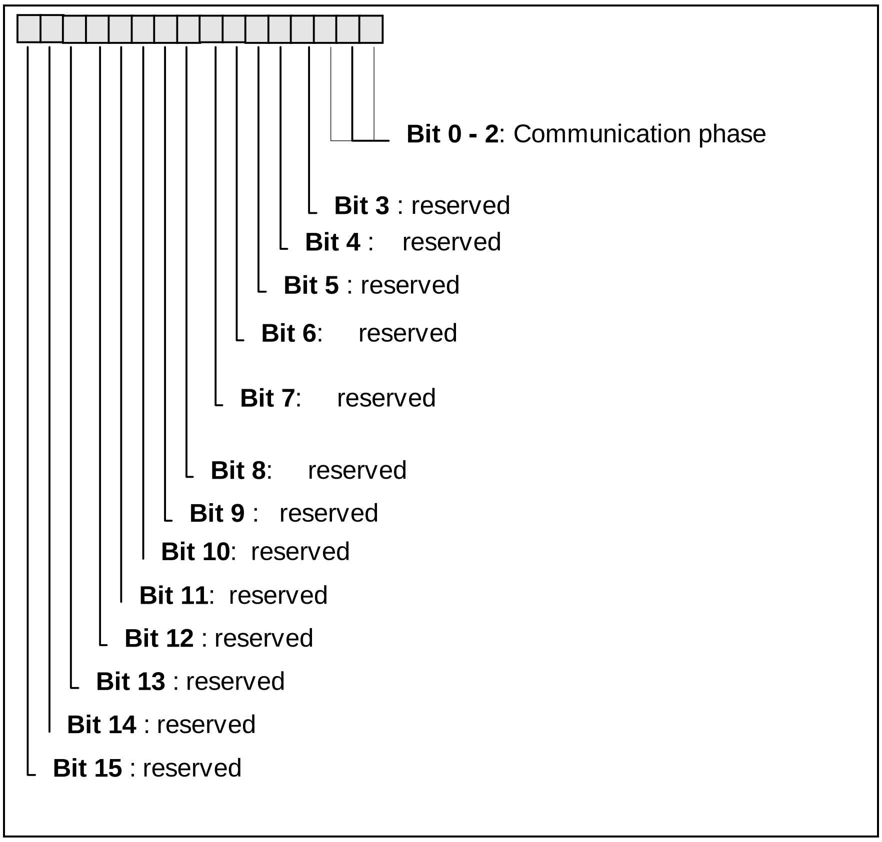


Fig. 2-1: S-0-0014, Interface Status

Note: This parameter is not available for DKC01.1/DKC11.1 firmware.

S-0-0014 - Attributes

ID number:	S-0-0014	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0017, IDN List of all operational Data

Desrciption:

The identification numbers of all drive data are included in this list. The parameters included in this IDN list are displayed by the IDN number, name, and value in DriveTop through the menu selection Parameter **|** List of all Parameters.

S-0-0017 - Attributes

ID number:	S-0-0017	**Editability:**	no
Function:	Parameter	**Memory:**	fixed
Data length:	2Byte variable	**Validity check:**	no
Format:	IDN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0021, IDN List of Invalid Op. Data for Comm. Ph.2

Description:

Before the drive executes the delayed phase switch from 2 to 3 that was initiated with command **S-0-0127, Communication phase 3 check**, it will check to see if all communication parameters are complete and correct. If the drive identifies one or more IDN's that are invalid, it will write the operating data that is still needed or is invalid in this ID No. list. This will be displayed to the drive through the command error diagnostic message **C101, Communication parameters incomplete**.

S-0-0021 - Attributes

ID number:	S-0-0021	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2Byte variable	**Validity check:**	no
Format:	IDN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0022, IDN List of Invalid Op. Data for Comm. Ph.3

Description:

Before the drive executes the phase delayed switch from 3 to 4 that was initiated with command **S-0-0128, Communication phase 4 transition check**, it will check the parameters for following items:

- the validity of the parameter
- parameter value is found within the possible input range between the min. and max. input value attributes.
- "Compatibility" with other parameters

If a parameter check proves negative, this operating data will be written in this ID No. list.

The drive then responds to the transition command with the communication error diagnostic message:

- C201 Parameter record incomplete or
- C202 Parameter limit value error or
- C203 Parameter conversion error

This IDN list of invalid parameters may be displayed and edited through the DriveTop menu selection Parameter/List of all invalid parameters.

S-0-0022 - Attributes

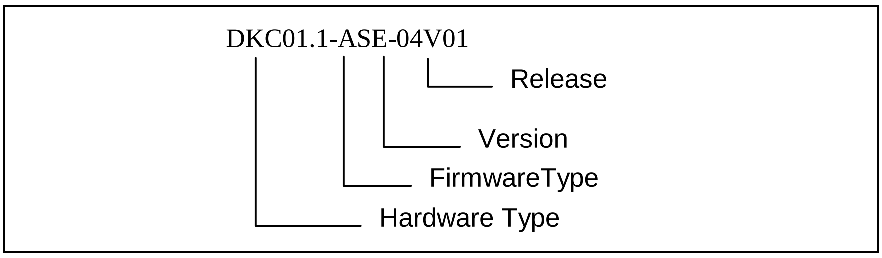
ID number:	S-0-0022	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2Byte variable	**Validity check:**	no
Format:	IDN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0030, Manufacturer Version

Description:

The drive firmware version can be read as text from this parameter.

Example:



S-0-0030 - Attributes

ID number:	S-0-0030	**Editability:**	no
Function:	Parameter	**Memory:**	fixed
Data length:	1Byte variable	**Validity check:**	no
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0032, Primary Mode of Operation

Description:

The mode of operation defined in this parameter will be activated in the drive when:

- the control and power sections are ready for operation
- the controller enable RF is set
- and the AH/Start signal has been given

The operating mode is selected by entering a bit list.

Bit list:	Meaning:
0000,0000,0000,0001	Torque regulation
0000,0000,0000,0010	Velocity regulation
0000,0000,0011,0011	Position regulation, positioning interface, with following error
0000,0000,0011,1011	Position regulation, positioning interface, without following error
1100,0000,0000,1011	Position regulation, step motor interface without following error, rotational feedback
1100,0000,0000,0011	Position regulation, step motor interface with following error, rotational feedback
1001,0000,0001,1011	encoder 1 angle synchronization, real master axis
1010,0000,0001,0010	speed synchronization, real master axis

Fig. 2-2: Mode of Operation

S-0-0032 - Attributes

ID number:	S-0-0032	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	10b

S-0-0033 Secondary Operation Mode 1

Description:

The first secondary operation mode is reserved for the jogging operation for DKC.

Any other auxiliary operating modes are not permitted.

S-0-0033 - Attributes

ID number:	S-0-0033	**Editability:**	no
Function:	Parameter	**Memory:**	Param. E²Prom
Data length:	2 byte	**Validity check:**	yes
Format:	binary	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:** 1100000000011011 b	

S-0-0036, Velocity Command Value

Description:

This parameter is used to set the velocity command value. This together with **S-0037 Additive, Velocity Command Value** determine the effective Velocity Command Value for the drive.

In the position control operating modes, this parameter displays the output error signal of the position controller.

S-0-0036 - Attributes

ID number:	S-0-0036	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	MDT
Input value min / max:	S-0-0044	**Default value:**	--

S-0-0037, Additive Velocity Command Value

Description:

The additive velocity command value is added to the

S-0-0036, Velocity command value in the drive.

S-0-0037 - Attributes

ID number:	S-0-0037	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	AT
Input value min / max:	S-0-0044	**Default value:**	--

S-0-0040, Velocity Feedback Value

Description:

The velocity feedback value is updated by the drive controller every 500ms. (This can be transferred via the serial communication interface.)

S-0-0040 - Attributes

ID number:	S-0-0040	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	AT
Input value min / max:	S-0-0044	**Default value:**	--

S-0-0041, Homing Velocity

Description:

Determines the velocity for the **S-0-0148, Drive controlled homing procedure** command in conjunction with the S-0-0108, Feedrate Override parameter. In the case of a drive motor with an absolute encoder (K-type feedback option), if the S-0-0148, Drive controlled homing procedure is initiated, then the drive will proceed to the reference point (home position) that was determined with the set absolute measurement, P-0-0012 command with this velocity.

S-0-0041 - Attributes

ID number:	S-0-0041	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0044	**Default value:**	+100.0000 Rpm

S-0-0042, Homing Acceleration

Description:

The acceleration value for the ramp up to homing velocity with which the **S-0-0148, Drive controlled homing procedure** command is performed is set in this parameter.

S-0-0042 - Attributes

ID number:	S-0-0042	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0160	**Default value:**	+1000.000 rad/s2

S-0-0043, Velocity Polarity Parameter

Description:

The polarity of the velocity data that is applied to the application can be switched in this parameter.

The polarity will be switched externally (at the command & feedback input; and actual value output) and not within the control system velocity regulator..

The following applies to rotary motors:

Clockwise rotation when facing the motor shaft is the rule for a positive velocity command value difference and a positive velocity feedback value polarity.

Structure of the parameter:

Bit 0 : Velocity command value
0: Positive polarity
1: Negative polarity
Bit 1 : Velocity command value, additive
0: Positive polarity
1: Negative polarity
Bit 2 : Velocity feedback value
0: Positive polarity
1: Negative polarity

Fig. 2-3: S-0-0043, Velocity Polarity Parameter

S-0-0043 - Attributes

ID number:	S-0-0043	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/--	**Default value:**	0 b

S-0-0044, Velocity Data Scaling Type

Description:

Various scaling types can be defined for the velocity data in the drive.

Examples:	RPM	->	rotary
	mm/min	->	linear

Structure of the parameter:

Bit 2 - 0: Scaling type
0 0 0: unscaled
0 0 1: linear scaling
0 1 0: rotary scaling

Bit 3 :
0 : preferred scaling
1 : parameter scaling

Bit 4 : **Unit of measure for linear scaling**
0 : meter [m]
1 : inch [in]
Unit of measure for rotary scaling
0 : revolution
1 : reserved

Bit 5 : **Unit of time**
0 : minute [min]
1 : second [sec]

Bit 6: **Data reference**
0 : to the motor shaft
1 : to the load

Bit 15 - 7: reserved

Fig. 2-4: S-0-0044, Velocity Data Scaling Type

Note: 1) For the case of load side linear scaling, changing the dimensional unit between meters (metric) and inches (English) will not result in an accurate conversion of data values to the new dimensional unit. A change in the linear dimensional unit will only result in a decimal point shift (scaling exponent change) to the left (change meter inches) or to the right (inches meters). It is therefore recommended that the linear dimensional unit be selected once and not changed. If the unit must be changed, then all operational data values must be corrected and scaled to reflect the new unit.
2) Preferred parameter scaling will automatically be selected if you use the parameter/scaling & mechanical setup dialog in DriveTop.
Preferred scaling will result in the following resolution:
Resolution with linear scaling: 10^{-6} m/min, 10^{-5} in/min
Resolution with rotary scaling: 10^{-4} rpm, 10^{-6} rev/s

See also example under **S-0-0045, Velocity Data Scaling Factor.**

S-0-0044 - Attributes

ID number:	S-0-0044	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Check_P3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	1010 b

S-0-0045, Velocity Data Scaling Factor

Description:

The scaling factor for all velocity data in the drive will be determined in this parameter.

If a preferred scaling is set with **S-0-0044, Velocity data scaling type**, this parameter will be set to 1.

Example:

Suppose that loadside linear scaling is desired with velocity units in meters/min. The DriveTop application parameter/scaling/mechanical program sets the preferred velocity scaling values through the value dialog.

S-0-0045, velocity data scaling factor	1
S-0-0046, Velocity data scaling expanent	-6
S-0-0049, Velocity data scaling type	100 100 1 b

Bit 2 -0 = 001 linear scaling

Bit 3 = 1 (Preferred) Parameter

Bit 4 = 0 Dimensional unit is meters (m)

Bit 5 = 0 Time unit is minutes (min)

Bit 6 = 1 Data referenced al load

Now suppose that a value of +1234567 is stored in the relavent velocity datum register. This datum value will be interpreted and displayed as:

+1234567 X 1 X 10^{-6} m/minor

or

+1234467 X 10 $^{-3}$ mm/min

or

As the value would be displayed in the IDN lists, +1234.567 mm/min with respect to the load. Note that the least significant decimal value is determined by the scaling exponent, in this example, as 10-6 m/min or 10-3 mm/min.

S-0-0045 - Attributes

ID number:	S-0-0045	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	MDT
Input value min / max:	1/65535	**Default value:**	1

S-0-0046, Velocity Data Scaling Exponent

Description:

The scaling exponent for all velocity data in the drive will be determined in this parameter.

See also example under **S-0-0045, Velocity Data Scaling Factor.**

S-0-0046 - Attributes

ID number:	S-0-0046	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	MDT
Input value min / max:	32/32	**Default value:**	-4

S-0-0047, Position Command Value

Description:

For the step motor interface, the position command value will be determined through the evaluation of the step-pulse signals present at this interface. The position command value that is determined in this fashion can be read here.

For the positioning interface, the position command value will be generated by the internal position command value interpolator. The active position command value can be read here.

S-0-0047-Attributes

ID number:	S-0-0047	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	MDT
Input value min / max:	S-0-0076	**Default value:**	--

S-0-0048, Additive position command value

Description:

If a synchronization mode with position control is selected, then the additive position command value in the drive is used to establish a position offset between master axis encoder and the following axis.

S-0-0048 - Attributes

ID number:	S-0-0048	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

S-0-0049, Positive position limit value

Description:

The "Positive position limit value" describes the maximum extent of travel in a positive direction.

The position limit is only active if all position data is referenced to the home point, i.e., the drive is homed. (Bit 0 in parameter **S-0-0403, Position feedback value status is** set to 1). The position limit values can be switched off through bit 4 in the **S-0-0055, Position polarity parameter** .

If a **target position** on the other side of the position limit is set in the drive, the warning **E253, Target position beyond the travel range** will be generated.

S-0-0049 - Attributes

ID number:	S-0-0049	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	+10000.00 Deg

S-0-0050, Negative position limit value

Description:

The "Negative position limit value" describes the maximum extent of travel in a negative direction.

The position limit is only active if all position data is referenced to the home point, i.e., the drive is homed. (Bit 0 in parameter **S-0-0403,** P**osition feedback value status is** set to 1). The position limit values can be switched off through bit 4? in the **S-0-0055, Position polarity parameter** .

If a target position on the other side of the position limit is set in the drive, the warning **E253, Target position beyond the travel range** will be generated.

S-0-0050 - Attributes

ID number:	S-0-0050	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	-10000.00 Deg

S-0-0051, Position Feedback Value 1 (Motor Feedback)

Description:

The "Position feedback value 1 (Motor feedback)" represent the current position of the rotational feedback. This value is updated each 500ms. (This can be read over the serial interface).

S-0-0051 - Attributes

ID number:	S-0-0051	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	AT
Input value min / max:	--	**Default value:**	--

S-0-0052, Reference Distance 1

Description:

This parameter represents the distance between the machine zero point and the home point for the motor measurement system (Position feedback value 1).

After the command **S-0-0148, C6 Drive controlled homing procedure** has been executed, the drive will set the **Position Command Value, S-0-0047** and the **Position feedback value S-0-0051** to this value.

S-0-0052 - Attributes

ID number:	S-0-0052	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	+0.00 Deg

S-0-0055, Position Polarity Parameter

Description:

This parameter can be used to invert the polarities of the given position data. These polarities will be switched outside of the control system position regulator (i.e., at the command and feedback valueinput to and actual value output from the control system).

Since the position data from the rotational feedback will be inverted, a different numeric value will result.

The following applies to rotary motors:

"Motor-clockwise rotation" = the motor shaft turns in clockwise direction (Facing the motor shaft) if the position command value difference and the position feedback polarity are both positive.

Bit 4 is used to activate or deactivate product position limits.

Structure of the parameter:

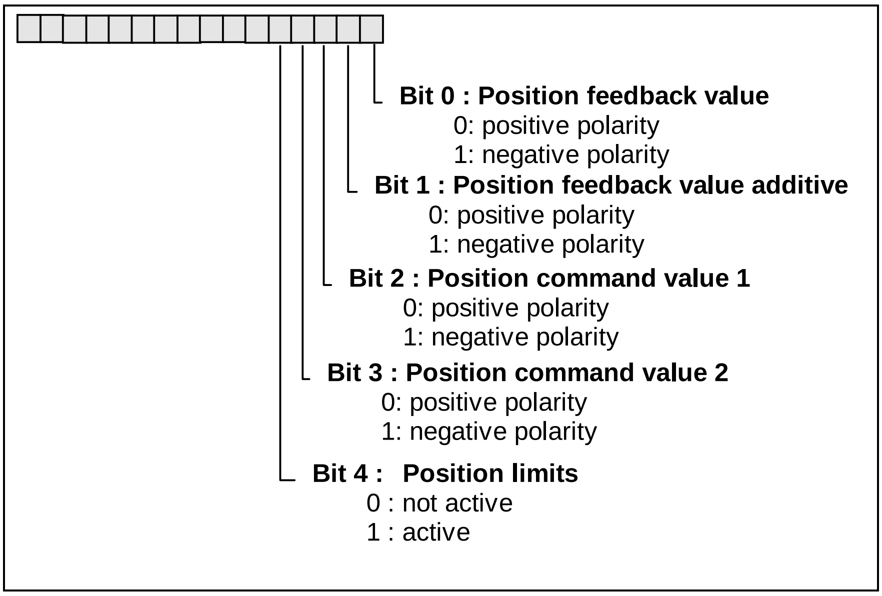


Fig. 2-5: S-0-0055, Position Polarity Parameter

Note: Only the bits named here are supported by the product. If bit 0 is altered by the control system, the drive will also set the value for bits 1 - 3 to match the value of bit 0.

S-0-0055 - Attributes

ID number:	S-0-0055	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/31	**Default value:**	0b

S-0-0057, Position Window

Description:

The drive will set the ouput "In Position" when the amount of the difference between the position feedback value and the position command value is less than the value of the position window.

During the command **S-0-0148, C6 Drive controlled homing procedure**, this parameter is used to signal the end of the command through the INPOS-output if the position feedback value enters into the home region ± S-0-0057.

G-Types - In-Pos functions as described during S-0-0148 parameter Command

K-Types - Old firmware S-0-0148 used to return to home. This command can no longerbe executed with K-type Fb’s. Results in C6/04 diagnostic.

S-0-0057 - Attributes

ID number:	S-0-0057	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0076	**Default value:**	+10.00 Deg

S-0-0059, Position Switch Flag Parameter

Description:

The flag for the position switch point is dependent on the position feedback value.

If S-0-0051 Position feedback value 1 is less than S-0-0060, Position switch point, the corresponding flag is set to 0. If the position feedback value is larger than or equal to the position switch point, the corresponding flag will be set to 1. The status of the output "path switch point" at pinx2/19 corresponds to this flag.

S-0-0059 - Attributes

ID number:	S-0-0059	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	binary	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0060, Position Switch Point 1

The position switches are made up of a position switch point and a position switch point-flag. If the position feedback value is less than the position switch point, the corresponding flag will be set to 0. If the position feedback value is larger than or equal to the position switch point, the corresponding flag will be set to 1.

S-0-0060 - Attributes

ID number:	S-0-0060	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	Param E2prom
Data length:	4 Byte	**Validity check:**	yes
Format:	S-0-0076	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	+0.00 Deg

S-0-0076, Position Data Scaling Type

Description:

Various scaling types for the position data in the drive can be set as described below. This parameter determines the scaling of all parameters with units of linear or rotary position or displacement.

Structure of the parameter:

Bit 2 - 0: Scaling type
0 0 0: unscaled
0 0 1: linear scaling
0 1 0: rotary scaling

Bit 3 :
0 : preferred scaling
1 : parameter scaling

Bit 4 : **Unit of measure for linear scaling**
0 : meter [m]
1 : inch [in]
Unit of measure for rotary scaling
0 : degree angles
1 : reserved

Bit 5 : reserved

Bit 6: **Data reference**
0 : to the motor shaft
1 : to the lead

Bit 7: **Processing format**
0 : absolut format
1 : modulo format

Bit 15 - 8: reserved

Fig. 2-6: S-0-0076, Position Data Scaling Type

Note: Only the bits named here are supported by the product.
1) Same as S-0-0044 Note 1
2) Same as S-0-0044 Notes 2
3) See example"Parameter Scaling Position Data" under S-0-0077

S-0-0076 - Attributes

ID number:	S-0-0076	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	1010b

S-0-0077, Linear Position Data Scaling Factor

Description:

This ID number contains the scaling factor that is to be used to scale all position data in the drive.

The parameter is set to 1 if linear preferred scaling has been setin Bit 3 of **S-0-0076, Position Data Scaling Type**.

Example:

Suppose that loadside, linear scaling is desried with dimensional units in meters. the parameter 1 Scaling /mechanical system dialog in DriveTop will set the position data scaling options on the drive as follows:

Parameter

S-0-0076, Position Data Scaling Type Value 01001001

Bit 2-0:	001, linear scaling
Bit 3:	1, (Preferred)Parameter Scaling
Bit 4:	0, Dimensional unit is meters (m)
Bit 6:	1, Data Referenced at the load
Bit 7:	0, Absolute processing format

S-0-0077, Linear Position Data Scation Factor 1

S-0-0078, Linear Position Data Scaling Exponent -6

Now suppose that the decimal value of +1234567 is stored in the relavent position data register. This datum value will be interpreted and displayed as:

+1234567X1X10^{-3} mm (Millimeters)

or

as the value would be displayed in the IDN lists, +1234.567 mm with respect ot the laod. Note that the least significant decimal value is determined by the scaling exponent, in this example, as 10^{-6} m or 10^{-3} mm.

S-0-0077 - Attributes

ID number:	S-0-0077	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/65535	**Default value:**	1

S-0-0078, Linear Position Data Scaling Exponent

Description:

This ID number contains the scaling exponent that is to be used to scale all position data in the drive if linear scaling has been selected.

If linear preferred scaling is selected, this parameter will be set by the drive.

S-0-0078 - Attributes

ID number:	S-0-0078	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	32/32	**Default value:**	-6

S-0-0079, Rotational Position Resolution

Description:

If rotary position scaling is selected, the LSB valence for all position data will be set in this parameter.

The LSB bit can be specified in the following manner:

Example:

If you would like a resolution of 0.01 degrees for the LSB, a value of 36,000 must be parameterized.

If a preferred scaling was set in the parameter **S-0-0076, Position Data Scaling Type**, the rotational position resolution will be set at 3,600,000. That means that the resolution for the LSB will be 0.0001 degrees.

S-0-0079 - Attributes

ID number:	S-0-0079	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/4294967295	**Default value:**	36000

S-0-0080, Torque/Force Command Value

Description:

This parameter shows the drive's current torque/force command value.

The evaluation is dependent upon the scaling of the torque and force data (z.Z. = at present, only percentage scaling is supported).

100% = Motor continous stand still torque, Mdn

S-0-0080 - Attributes

ID number:	S-0-0080	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0086	**Combination check:**	no
Posit. after the dec.:	S-0-0086	**Cyc. transmittable:**	MDT
Input value min / max:	S-0-0086	**Default value:**	+0.0%

S-0-0084, Torque/Force Feedback Value

Description:

This parameter represents the motor's current torque feedback value.

The evaluation is dependent upon the scaling of the torque and force data (z.Z = e.g., only percentage scaling is supported).

100% = Motor stand still torque

S-0-0084 - Attributes

ID number:	S-0-0084	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0086	**Combination check:**	no
Posit. after the dec.:	S-0-0086	**Cyc. transmittable:**	AT
Input value min / max:	S-0-0086	**Default value:**	--

S-0-0085 Torque Polarity Parameter

Description:

The polarities for the given torque data that is related to the application can be switched in this parameter.

The polarity will be switched externally (at the command & feedback value input and actual value output) not inside the controlled system.

The following applies to rotary motors:

Clockwise rotation when facing the motor shaft is the rule for a positive torque command value and a positive torque feedback value polarity.

Structure of the parameter:

Bit 0 : Torque command value
0: positive polarity
1: negative polarity

Bit 1 : Torque command value additive
0: positive polarity
1: negative polarity

Bit 2 : Torque feedback value
0: positive polarity
1: negative polarity

Fig. 2-7: S-0-0085, Torque/Force Polarity Parameter

Note: If bit 0 is altered, the drive will also set the value of bits 1 - 2 to match the value of bit 0.

S-0-0085 - Attributes

ID number:	S-0-0085	**Editability:**	P23
Function:	Parameter	**Memory:**	Param E²Prom
Data length:	2 Byte	**Validity check:**	Phase 3
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	0b

S-0-0086, Torque/Force Data Scaling Type

Description:

At the present time only the percentage scaling for the torque force data is supported.

The following applies:

100 % = **S-0-0111, Motor current at standstill**

S-0-0086 - Attributes

ID number:	S-0-0086	**Editability:**	23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	MDT
Input value min / max:	--	**Default value:**	0b

S-0-0091, Bipolar Velocity Limit Value

Description:

The "bipolar velocity limit value" describes the maximum allowable velocity that is symmetrical in both directions. The maximun input value is restricted by **S-0-0113, Motor-maximum speed**.

The value entered generates the maximum value for all other speed parameters.

S-0-0091 - Attributes

ID number:	S-0-0091	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	MDT
Input value min / max:	0/S-0-0113		
Default value:	+3000, 0000 RPM		

S-0-0092, Bipolar Torque/Force Limit Value

Description:

This parameter describes the maximum allowable torque that is symmetrical in both directions (accelerating, braking).

The evaluation refers to the percentage of the motor current at standstill.

100% = Motor current at standstill

Note: The maximum torque is also influenced by:
- **P-0-0006, Overload factor**
- **P-0-4011, Switching Fregquency**

S-0-0092 - Attributes

ID number:	S-0-0092	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0086	**Combination check:**	no
Posit. after the dec.:	S-0-0086	**Cyc. transmittable:**	MDT
Input value min / max:	0/calculated peak torque		
Default value:	+500.0%		

S-0-0093, Torque/Force Data Scaling Factor

Description:

The scaling factor for all torque/force data in the drive are set in this parameter.

The parameter has no meaning at the present time because only percentage scaling can be set for torque and force data.

S-0-0093 - Attributes

ID number:	S-0-0093	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/65535	**Default value:**	1

S-0-0094, Torque/Force Data Scaling Exponent

Description:

The scaling exponent for all torque/force data in the drive are set in this parameter.

The parameter has no meaning at the present time because only percentage scaling can be set for torque and force data.

S-0-0094 - Attributes

ID number:	S-0-0094	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	-1

S-0-0095, Diagnostic Message

Description:

The operating status for the drive that is relevant at the moment can be read in text form in this parameter.

The respective diagnostic message number from **S-0-0390, Diagnostic Message Nummer** will appear in front of this parameter.

Example: **"A010 Drive Halt "**

S-0-0095 - Attributes

ID number:	S-0-0095	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	1 byte variable, up to 40 characters		
Validity check:	no		
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0097, Mask Class 2 Diagnostic

Description:

This parameter is not used in DKC01/DKC11.

S-0-0097 - Attributes

ID number:	S-0-0097	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--		
Default value:	1111 1111 1111 1111 b		

S-0-0098, Mask Class 3 Diagnostic

Description:

This parameter is not used in DKC01/DKC11.

S-0-0098 - Attributes

ID number:	S-0-0098	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--		
Default value:	1111 1111 1111 1111 b		

S-0-0099, C5 Reset Class 1 Diagnostic

Description:

This command can be activated with the S1 key on the controller or through the serial interface. All errors in the drive will be cleareddeleted when this command is started through the serial interface. The drive will switch to the "ready for operation" status if no further errors exist.

If the " Reset class 1 diagnostic" command is started with the S1 key, only one error will be deleted at a time. If the drive has stored several errors (up to 4 errors), a diagnostic message that corresponds to each error will appear sequentially each time the S1 key is pressed.

See also Function description: "Executing Parameter Commands"

S-0-0099 - Attributes

ID number:	S-0-0099	**Editability:**	P234
Function:	Command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

Exception: Error “F2/26 undervoltage in the power section” is cleared by removing the drive enable, signal (Rf = 0) at pin X2-2.

S-0-0100, Velocity Loop Proportional Gain

Description:

This parameter contains the value for the velocity loop proportional gain.

The option is available to load motor-specific default values for the control loop parameters with the "Basic load" command.

See also Function description: "Setting the velocity loop"

S-0-0100 - Attributes

ID number:	S-0-0100	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	As/rad	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0/312.9	**Default value:**	.07 A/rad/s

S-0-0101, Velocity Loop Integral Action Time

Description:

The velocity controller forms a current command value from the difference between the velocity command value and the velocity feedback value (= speed regulation deviation).

This current command value consists of a proportional component and an integral component. The Velocity Loop Integral Action Time corresponds to the time in which the integral component of the current command value is growing on the value of the proportional component.

Definition of the Integral Action Time

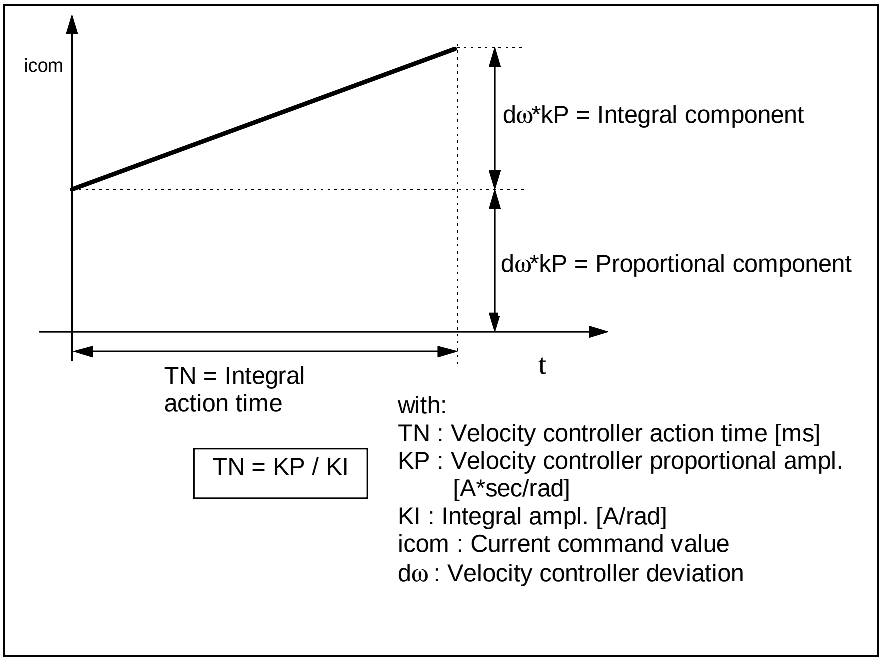


Fig. 2-8: Integral Action Time

The value of the time axis for which the integral component is equal to the proportional component is described as integral action time, ie t=TN when icmd =2xdw*KP. This represents the time that a pure I-controller would need until the controller output variable y is equal to the output variable of a P-controller at time t = 0.

The integral gain component is disabled with the input value TN= 0sec.

See also Function description: "Setting the velocity loop"

S-0-0101 - Attributes

ID number:	S-0-0101	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	ms	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	2/3276.7	**Default value:**	15.0 ms

S-0-0103, Modulo Value

Description:

When Modulo format that is set (Parameter **S-0-0076, Position scaling** bit 7) the position data in the range from 0 to the module value, S-0-0103 can be represented. For monotonicly increasing position data, when the position value equals the module value, the position data is set to and overflows fro zero. If the position data are represented in modulo format the input range for all position data must be between **modulo value** and the **modulo value**.

See also Function description: "Boundary Conditions for Modulo Processing"

S-0-0103 - Attributes

ID number:	S-0-0103	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0076	**Default value:**	+360.00 Deg

S-0-0104, Position Controller KV-Factor (closed-loop control)

Description:

This parameter contains the value for the proportional gain of the position loop controller. The option is available to load a default value for this control loop parameter with the "Basic load" command.

See also Function description: "Determining the Velocity Control loop Setting"

S-0-0104 - Attributes

ID number:	S-0-0104	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	1000/min	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0,02/239	**Default value:**	1000/min

S-0-0106, Current Controller, Proportional Gain 1

Description:

This parameter represents the proportional gain of the current controller.

The current controller proportional gain is determined for each of the motor-drive Combinations. It depends on the type of motor and may not be changed. Using the command "load default values", it can be loaded out of the motor feedback.

Note: Values set at the factory should not be altered!

See also Function description: "Setting the Current Regulator"

S-0-0106 - Attributes

ID number:	S-0-0106	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	V/A	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0/500	**Default value:**	30.00 V/A

S-0-0107, Current Loop Integral Action Time 1

Description:

The current controller reset time is fixed for each motor/drive combination. It depends on the type of motor and may not be changed. It can be determined using the command "load base default values".

2ms are loaded for the current controller integral action time 1 with the command "load default values".

See also Function description: "Setting the Current Regulator"

S-0-0107 - Attributes

ID number:	S-0-0107	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	ms	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0.1/6553.5	**Default value:**	--

S-0-0108, Feedrate Override

Description:

The feedrate override only works for "drive controlled motion commands" like:

- "Drive controlled homing procedure" command
- "Programmed positioning block" operating mode
- Jogging operation
- automatic control loop setting
- synchronization speed during angle synchronization

In such instances, the drive calculates the velocity command value itself. The feedrate override has a multiplying effect on the homing velocity, the block velocity and the jog velocity.

Note: Feedrate override may be controlled either by this parameter or by the analog E1-E2 input depending on the value set in Bit 0 of the function parameter, P-0-4027.
Bit 0: 0 = Feedrate override set in parameter S-0-0108
1 = Feedrate override via analog channel E1-E2

S-0-0108 - Attributes

ID number:	S-0-0108	**Editability:**	P4
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	%	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0/655,35	**Default value:**	100.00 %

S-0-0109, Motor Peak Current

Description:

Specifies the maximum current which may flow through the motor for a brief period without damaging it.

If the motor's peak current is less than the amplifier's peak current, the maximum current that is available will be automatically limited to the motor's peak current.

This value is stored in motor feedback for MDD and MKD motors and will be uploaded to the controller ram when the controller is turned on.

S-0-0109 - Attributes

ID number:	S-0-0109	**Editability:**	no
Function:	Parameter	**Memory:**	Feedb.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0/500	**Default value:**	--

S-0-0110, Amplifier Peak Current

Description:

Peak current available from the drive controller . The value will be set by the drive itself. This current is only available for short dusations.

S-0-0110 - Attributes

ID number:	S-0-0110	**Editability:**	no
Function:	Parameter	**Memory:**	Fixed -E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0.001/500	**Default value:**	--

S-0-0111, Motor Current at Standstill

Description:

The "motor current at standstill" is the continous motor current capability at standstill according to the motor data sheet.

This value is stored in motor feedback for MDD and MKD motors and will be loaded into the controller ram when the controller is turned on.

All torque / force data refer to motor current at standstill = 100%

S-0-0111 - Attributes

ID number:	S-0-0111	**Editability:**	no
Function:	Parameter	**Memory:**	Feedb.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0/500	**Default value:**	--

S-0-0112, Amplifier Nominal Current

Description:

Allowable continious current output for the drive controller . The value will be set by the drive itself.

S-0-0112 - Attributes

ID number:	S-0-0112	**Editability:**	no
Function:	Parameter	**Memory:**	Fixed-E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0.001/500	**Default value:**	--

S-0-0113, Maximum Motor Speed

Description:

The maximum velocity for the motor cannot be exceeded. It also limits the **S-0-0091, Bipolar velocity limit value** parameter.

This value is stored in the motor feedback of MDD and MKD motors and will be loaded into the controller ram when the controller is turned on.

In torque regulation, if the maximum motor speed is exceeded by more than 12.5%, the drive will be switched into a torque free state and the error message **F879, Velocity limit value exceeded** will result.

S-0-0113 - Attributes

ID number:	S-0-0113	**Editability:**	P23
Function:	Parameter	**Memory:**	Feedb. E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0044	**Default value:**	--

S-0-0116, Resolution of Rotational Feedback 1

Description:

For motors with resolver feedback, the resolution of the rotational feedback is equal to the number of motor pole pairs. That means that a motor with 4 pole pairs has a resolver with 4 electrical cycles per mechanical revolution of the motor.

This value is stored in feedback memory and cannot be changed.

S-0-0116 - Attributes

ID number:	S-0-0116	**Editability:**	P23
Function:	Parameter	**Memory:**	Feedb.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	Cycl/Rev or inch (depending on P-0-4014)		
Combination check:	no		
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0121, Input Revolutions of Load Gear

Description:

A mechanical gear will often be employed between the motor and the load.

The gear ratio is defined by:

$$\frac{\textbf{S-0-0122, Output Revolutions of load Gear}}{\textbf{S-0-0121, Input Revolutions of load Gear}}$$

Fig. 2-9: Gear Ratio

See also Function description: "Boundary Conditions for Modulo Processing"

Example:

5 motor rotations result is 2 output gear rotations

S-0-0121 : 5

S-0-0122 : 2

S-0-0121 - Attributes

ID number:	S-0-0121	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	Rev	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/4294967295	**Default value:**	1 Rev

S-0-0122, Output Revolutions of Load Gear

Description:

A mechanical gear will often be employed between the motor and the load.

The gear ratio is defined by:

$$\frac{\text{S-0-0122, Output Revolutions of load Gear}}{\text{S-0-0121, Input Revolutions of load Gear}}$$

Fig. 2-10: Gear Ratio

Example:

5 motor rotations result is 2 output gear rotations

S-0-0121 : 5

S-0-0122 : 2

S-0-0122 - Attributes

ID number:	S-0-0122	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	Rev	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/4294967295	**Default value:**	1 Rev

S-0-0123, Feed Constant

Description:

This parameter describes the conversion from rotary to linear motion . It is defined as the linear displacement of the load measrued during one rotation of the loadside gear drive shaft.

Ball screw spindle:	Rack and pinion:
Feed constant=pitch of screw (typical value 10.00 mm)	Feed constant= actual pitch diameter for the pinion * Pi (= range of the effect of the pinion)

Fig. 2-11: Characteristic value for the feed constant

S-0-0123 - Attributes

ID number:	S-0-0123	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	5	**Cyc. transmittable:**	no
Input value min / max:	--		
Default value:	10 000. 00 mm/rev		

S-0-0124, Standstill window

Description:

The motor's standstill is defined by that condition that the value of the **Velocity Feedback Value, S-0-0040** remains below the threshold for which can be set in this parameter (the "Standstill window").

In standstill the output signal "In motion" will be removed .

S-0-0124 - Attributes

ID number:	S-0-0124	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0044	**Default value:**	10.0000 Rpm

S-0-0127, C1 Communication Phase 3 Transition Check

Description:

The commands "S-0-0127, C1 Communication phase 3 transition check and "**S-0-0128, C2 Communication phase 4 transition check**" are used to switch form the parameteri mode to the operating mode.

When the "**S-0-0127, C1 Communication phase 3 transition check**" command is used, the validity of all of the interface parameters will be checked. If any of the parameters are found invalid, the drive ends the command with an error message.

See also Function description: "Executing Parameter Commands"

S-0-0127 - Attributes

ID number:	S-0-0127	**Editability:**	P2
Function:	Command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

S-0-0128, C2 Communication Phase 4 Transition Check

Description:

The commands **S-0-0127, C1 Communication phase 3 transition check** and S-0-0128, C2 Communication phase 4 transition check" are used to switch form the parametermode to the operatemode.

When the **S-0-0128, C2 Communication phase 4 transition check** command is executed , all parameters will be checked for validity and limit value encroachments. If any invalid parameters or any limit values have been encroached upon, the drive would end the command with an error message.

See also Function description: "Executing Parameter Commands"

S-0-0128 - Attributes

ID number:	S-0-0128	**Editability:**	P3
Function:	Command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

S-0-0134, Master Control word

Beschreibung:

The drive sets the master control word in terms of the digital inputs. This makes it possible to read the master control word via the interface.

In addition, the master control word provides help in commissioning and troubleshooting.

S-0-0134 - Attributes

Ident number:	S-0-0134	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	Bin	**Limit check:**	No
Unit:	---	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0135, Drive Status Word

Description:

This parameter makes it possible to read the drive status word through the serial interface.

It is structured as follows:

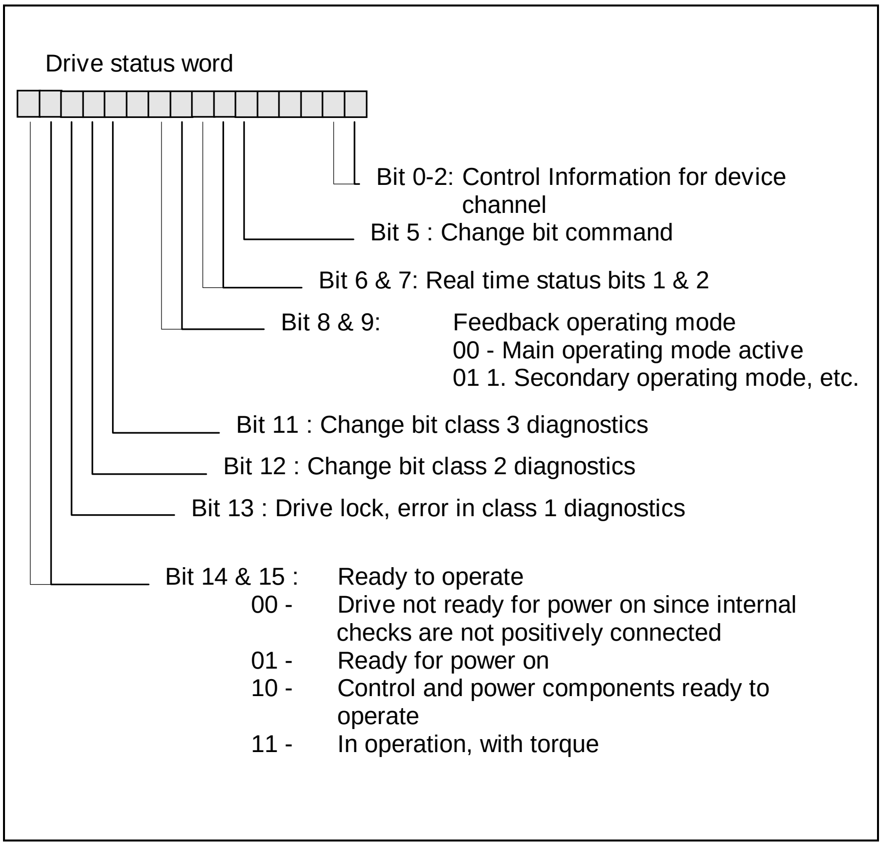


Fig. 2-12: Structure of the Drive Status Word

S-0-0135 - Attributes

ID number:	S-0-0135	**Editability:**	--
Function:	Parameter	**Memory:**	--
Data length:	2 Byte	**Validity check:**	no
Format:	binary	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0138, Bipolar Acceleration Limit Value

Description:

The "bipolar accelaration," describes the maximum allowable accelaration that is symmetrical in both directions (acceleration and decelaration).

With operating mode step motor interface, speed and angle synchronization, the drive brakes with this acceleration rate.

During the jogging operation, the drive accelerates and brakes at this decelaration .

S-0-0138 - Attributes

ID number:	S-0-0138	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	MDT
Input value min / max:	0/S-0-0160	**Default value:**	+1000.000 rad/s2

S-0-0140, Controller Type

Description:

The device type of the manufacturer can be found in text form in the operating data for the controller type.

Example:

DKC01.1-040-7

S-0-0140 - Attributes

ID number:	S-0-0140	**Editability:**	no
Function:	Parameter	**Memory:**	Fixed -E²prom
Data length:	1Byte variable	**Validity check:**	Phase3
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0141, Motor Type

Description:

The company name and the motor type of the connected motor can be found in the operating data for the motor type in text form.

This value is stored for MDD and MKD motors in the motor feedback and will be loaded from thereinto the controller Ram when the drive is started for the first time.

Example:

MKD 071B-061-KP1-BN

S-0-0141 - Attributes

ID number:	S-0-0141	**Editability:**	P23
Function:	Parameter	**Memory:**	Feedb.E²prom
Data length:	1Byte variable	**Validity check:**	Phase3
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0142, Application Type

Description:

A descriptive name for the drive can be stored in this parameter (e.g., swivel axis). It has no functional significance.

S-0-0142 - Attributes

ID number:	S-0-0142	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	1Byte variable, max. 40 characters		
Validity check:	Phase3		
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	Default

S-0-0147, Homing Parameter

Description:

The processes for the D**rive controlled homing procedure, S-0-0148** in relation to the machine layout , NC and drive installation will be set in this parameter.

Structure of the parameter:

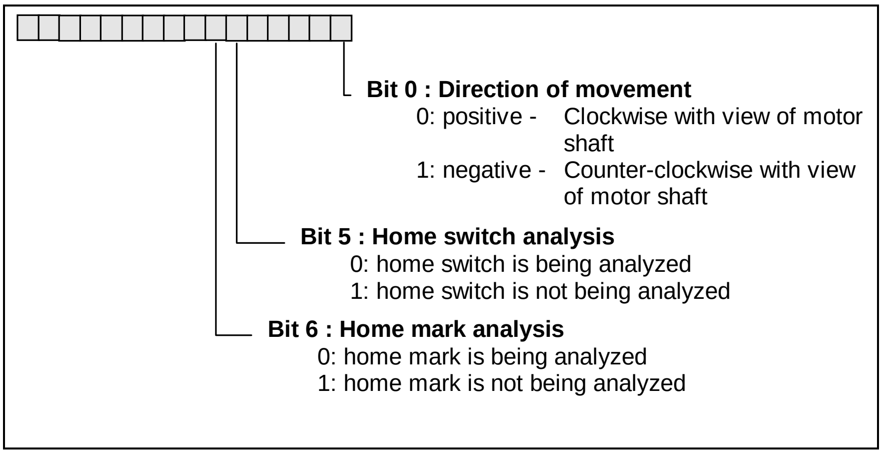


Fig. 2-13: S-0-0147, Homing Parameter

Note: Only the bits named here are supported by the product.

S-0-0147 - Attributes

ID number:	S-0-0147	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	100 b

S-0-0148, C6 Drive Controlled Homing Procedure

Description:

When this command is set (NF,X2/13=1), the drive automatically switches into position control and accelerates using the **Homing acceleration, S-0-0041** to the **Homing velocity, S-0-0042.** Bit 0 in the **Position feedback value status, S-0-0403** will be reset to zero

The process for the homing procedure can be determined with the **Homing Parameter, S-0-0147**. After the command (drive is at stand still and position feedback value is related to the homing position) has been properly executed, the drive sets bit 0=1 in the **Position feedback value status, S-0-0403** parameter.

The position feedback value status parameter corresponds to the output "In reference ".

See also Function description: "Executing Parameter Commands"

S-0-0148 - Attributes

ID number:	S-0-0148	**Editability:**	P4
Function:	Command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

S-0-0150, Reference Offset 1

Description:

This parameter describes the distance between the Position feedback reference mark 1 and the **Reference distance 1, S-0-0052**.

At the end of the coming drive controlled homing procedure, the drive will position itself at the point equal to the Reference distance 1+ Reference offset 1.

S-0-0150 - Attributes

ID number:	S-0-0150	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	+0.00 Deg

S-0-0159, Monitoring Window

Description:

The monitoring window makes it possible to set the maximum tolerable deviation between the measured position and the calculated position feedback value. If the position exceeds crosses into the monitoring window, the drive will set the error **F228, Excessive control deviation** in class 1 diagnostics.

The largest deviation that occurs will be stored in parameter **P-0-0098, Maximum model deviation**.

S-0-0159 - Attributes

ID number:	S-0-0159	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0076	**Default value:**	+30.00 Deg.

S-0-0160, Acceleration Data Scaling Type

Description:

Various scaling types can be set as described be;pw for the acceleration data in the drive as defined by the bit values of this parameter .

Structure of the parameter:

Bit 2 - 0: Scaling type
0 0 0: unscaled
0 0 1: linear scaling
0 1 0: rotary scaling

Bit 3 :
0 : preferred scaling
1 : parameter scaling

Bit 4 : **Unit of measure for linear scaling**
0 : meter [m]
1 : inch [in]
Unit of measure for rotary scaling
0 : degree angles
1 : reserved

Bit 5 : **Unit of time**
0 : seconds [s]
1 : reserved

Bit 6: **Data reference**
0 : to the motor shaft
1 : to the load

Bit 15 - 7: reserved

Fig. 2-14: S-0-0160, Acceleration Data Scaling Type

Note: Only the bits named here are supported by the product.
1) Same as S-0-0044 Note 1
2) Same as S-0-0044 Notes 2

3) Example: (Acceleration data scaling)

Suppose that loadside, linear scaling as desired with acceleration units in M/s2. The Parameter 1 scaling/mechanical system dialog in DriveTop will set the preferred acceleration data scaling options on the drive as follows:

Parameter	Value
S-0-0159, Acceleration data scaling type	1001001

Bit 2-0 001 linear scaling

Bit 3: 1 (Preferred) parameter scaling

Bit 4: 0 Dimensional unit in meters (m)

Bit 5: 0 Time unit in seconds (s)

Bit 6: 1 Data referenced at load

S-0-0161, Acceleration data scaling factor	1
S-0-0162, Acceleration data scaling exponent	-6

Now suppose that the decimal value +1234567 is stored in the relavent acceleration data register. The datum value will be interpreted and displayed as:

or $+1234.567X10^{-3}$ mm/s^2

or

as the value would be displayed in the IDN lists, +1234.467 mm/s2 with respect to the load. Note that the least significant decimal value is determined by the scaling exponent, in this exaple, as 10^{-6} m/s^2 or 10^{-3} mm/s^2

S-0-0160 - Attributes

ID number:	S-0-0160	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	1010 b

S-0-0161, Acceleration Data Scaling Factor

Description:

If parameter scaling is set in **S-0-0160, Acceleration data scaling type** the scaling factor for all acceleration data in the drive will be determined in this parameter.

Structure of the parameter:

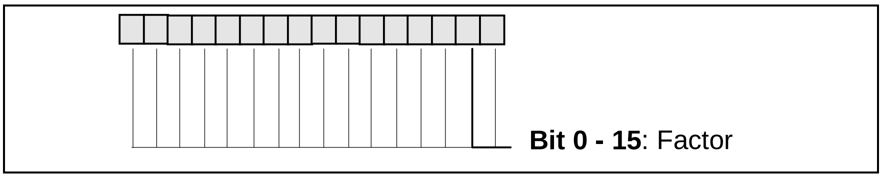


Fig. 2-15: S-0-0161, Scaling Factor for Acceleration

S-0-0161 - Attributes

ID number:	S-0-0161	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/65535	**Default value:**	1

S-0-0162, Acceleration Data Scaling Exponent

Description:

If parameter scaling is set in **S-0-0160, Acceleration data scaling type** the scaling exponent for all acceleration data in the drive will be determined in this parameter.

S-0-0162 - Attributes

ID number:	S-0-0162	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	AT
Input value min / max:	32/32	**Default value:**	-3

S-0-0182, Manufacturer Class 3 Diagnostics

Description:

Different messages regarding operating status will be stored here every 8ms. If the status of a message were to change, this would not be signalled by an editing bit.

Structure of the parameter:

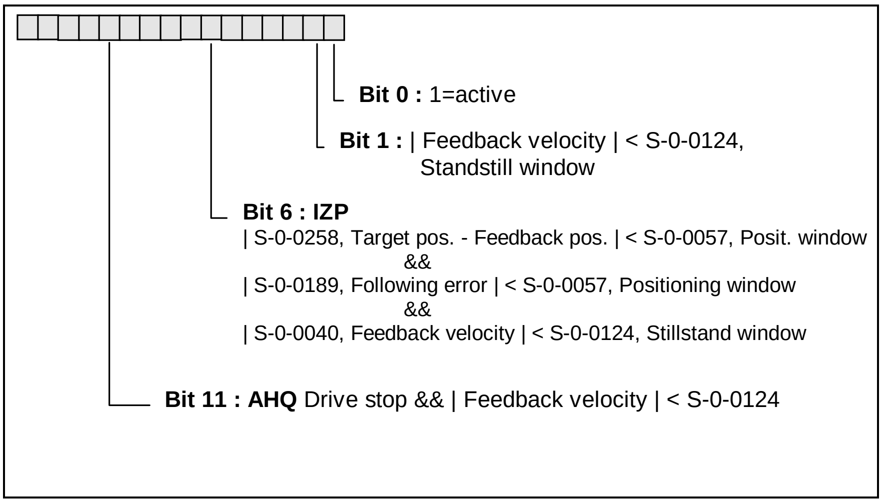


Fig. 2-16: S-0-0182, Manufacturer Class 3 Diagnostics

Note: Only the bits named here are supported by the product.

S-0-0182 - Attributes

ID number:	S-0-0182	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	AT
Input value min / max:	--	**Default value:**	--

S-0-0183, Velocity Synchronization Window

Description:

If during the operating mode "velocity-synchronization" the difference between velocity command value and feedback value is smaller than the synchronization window, then bit 8 in the S-0-0182, Manufacturer Class 3 Diagnostics will be set.

The following apply:

Bit 8 = 1, if: $| dX_{Synch} + dX_{Additiv} - dX_{Feedback} | <$ S-0-0183

with $dX_{Feedback}$: Velocity feedback value

dX_{Synch}: Synchronized velocity command value, produced from actual steering axle velocity

$dX_{Additiv}$: Additive velocity command value, S-0-0037

See also the function description: "Check-back with speed synchronization"

S-0-0183 - Attributes

ID number:	S-0-0183	**Modification:**	P234
Function:	Parameter	**Storage:**	Param.E²prom
Data length:	4 bytes	**Validity check:**	Phase3
Format:	DEC_MV	**Limit check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Fractional part digits:	S-0-0044	**Cyclic transfer:**	no
Input min./max.:	>0/S-0-0044	**Default value:**	10,0000

S-0-0189, Following Error

Description:

The drive stores the current difference between positoin command and actual position value in this operating data (**S-0-0051, actual position value 1).**

See also function description: "Determining the Position Regulator Setting" and **P-0-0098, maximum model deviation**.

S-0-0189 - Attributes

ID number:	S-0-0189	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit English:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	--	**Default value:**	--

S-0-0192, IDN-List of Backup Operation Data

Description:

The ID numbers for all of the operating data that must be loaded in the drive for proper operation are backed up in the IDN list. Customarily these are the parameters that are buffered in the parameter E^2Prom.

The control and to a file Drive Top use this IDN list to create a backup copy of the drive parameters.

S-0-0192 - Attributes

ID number:	S-0-0192	**Editability:**	no
Function:	Parameter	**Memory:**	fixed
Data length:	2Byte variable	**Validity check:**	no
Format:	IDN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0193, Positioning Jerk

Description:

The positioning jerk limits the acceleration change with respect to time in the operating mode with "Drive internal interpolation".

- Referencing
- Jogging
- control loop seting
- AH with step motor interface

Note: At 0 value, the jerk filter is shut off.

S-0-0193 - Attributes

ID number:	S-0-0193	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0160	**Default value:**	0

S-0-0228, Position Synchronization Window

Description:

If the difference between the position command value and the feedback value is smaller than the synchronization window during the parameterized synchronization operating mode with underlying position control, then bit 8 in the **S-0-0182, Manufacturer Class 3 Status** will be set.

The following apply:

Bit 8 = 1, if: $| X_{Synch} + X_{Additiv} - X_{Feedback} | <$ S-0-0228

with $X_{Feedback}$: Position feedback value S-0-0051 or S-0-0053

X_{Synch}: Synchronized position command value, compiled from the actual steering axle position

$X_{Additiv}$: Additive position command value, S-0-0048

See also the function description: "Check-back with angle synchronization"

S-0-0228 - Attributes

ID number:	S-0-0228	**Editability:**	P2,P3,P4
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Extreme value check:**	yes
Units English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0076	**Default value:**	--

S-0-0236, Lead Drive 1 Rotation

Description:

The gear ratio between the master drive 1 and the slave drive is calculated as follows:

$$\text{Conversion relationship 1} = \frac{\textbf{slave drive revolutions-1 S-0-0237}}{\textbf{Master drive 1 revolutions S-0-0236}}$$

Fig. 2-1: S-0-0236, Gear Ratio

Themaster Drive 1 Rotations, S-0-0236 must have valid data .

See also function description: "Speed synchronization"

S-0-0236 - Attributes

ID number:	S-0-0236	**Editability:**	P2,P3
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Units English:	--/--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/0xFFFFFFFF	**Default value:**	--

S-0-0237, Slave Drive Rotation I

Description:

The gear ratio between the master drive 1 and the slave drive is calculated as follows:

$$\text{Conversion relationship 1} = \frac{\textbf{slave drive revolutions-1 S-0-0237}}{\textbf{Master drive 1 revolutions S-0-0236}}$$

Fig. 2-2: S-0-0237, Gear Ratio

The Slave Drive Rotations I, S-0-0237 must have valid data..

See also function description: "Speed synchronization"

S-0-0237 - Attributes

ID number:	S-0-0237	**Editability:**	P2,P3
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Units English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/0xFFFFFFFF	**Default value:**	--

S-0-0258, Target Position

Description:

The target position will be assigned to the drive as a command value by the controller in the "Drive internal interpolation" operating mode. The drive travels toward the "target position" with due regard to **S-0-0259, Positioning velocity**, the **S-0-0260, Positioning acceleration** and **S-0-0193, Positioning jerk**.

In the "Position control with positioning interface" operating mode, the target position of the current Positioning Position block will be copied to parameter **S-0-0258, Positioning target position**.

S-0-0258 - Attributes

ID number:	S-0-0258	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	MDT
Input value min / max:	S-0-0076	**Default value:**	--

S-0-0259, Positioning Velocity

Description:

In the "Drive internal interpolation" operating mode, the **S-0-0258, Target position** is approached with the positioning velocity. In the "Block controlled " operating mode, the positioning velocity of the current Positioning block is copied to the parameter **"S-0-0259, Positioning velocity"**.

The speed effective with automatic control loop settings is also set with this parameter.

S-0-0259 - Attributes

ID number:	S-0-0259	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_M?V	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	MDT
Input value min / max:	S-0-0044	**Default value:**	+1.0000 Rpm

S-0-0260, Positioning Acceleration

Description:

"Positioning acceleration" is used in the "Drive internal interpolation" operating mode to accelerate up to the **S-0-0259, Positioning velocity** .

In the "Block controlled operation" operating mode, the positioning acceleration of the current Positioning blocl is copied to the parameter **S-0-0260, Positioning acceleration**. The positioning acceleration is active with automatic control loop settings.

The acceleration active in control loop settings is also set with this parameter.

S-0-0260 - Attributes

ID number:	S-0-0260	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_M?V	**Extreme value check:**	yes
Unit English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	MDT
Input value min / max:	S-0-0160	**Default value:**	+1000.000rad/s²

S-0-0262, Command Basic Load

Description:

When this command is set and enabled the default parameters in the motor for current, velocity and position control loop settings will be loaded and activated. The default parameters are **not** optimized for all applications. They establish a stable control loop status.

ATTENTION

⇒ When this command is executed, parameters that have already been optimized may be overwritten.

See also Function description: "Executing Parameter Commands"

S-0-0262 - Attributes

ID number:	S-0-0262	**Editability:**	P234
Function:	Command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

S-0-0265, Language Selection

Description:

Within the drive controller there are parameter names, units and diagnostic message-/storaged addresses collectively stored in more than one language. These parameters will establish in which language the text should be given by the setting of this parameter.

- 0 : German
- 1 : English
- 2 : French
- 3 : Spanish
- 4 : Italian

S-0-0265 - Attributes

ID number:	S-0-0265	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Units English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/4	**Default value:**	0

S-0-0267, Passwort

Description:

A customer-specific pasword can prevent access by unauthorized persons. The password "007" is set at the factory. This password permits write access to the parameters.

P-0-0267 - Attributes

ID number:	S-0-0267	**Editability:**	P234
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	0 Byte - max.	**Validity check:**	yes
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	007

S-0-0269, Parameter Buffer Mode

Description:

The "Parameter buffer mode" is used to determine whether the data transmitted through the serial interface will be stored temporarily (in RAM) or permanently (in EEPROM).

1: Data will not be stored permanently.

0: Data will be stored permanently.

After the control voltage supply has been switched on, the drive will initialize bit 0 to "0". To activate temporary storage mode bit 0 must be forced to “1”.

Note: For applications that wirte cylic or frequenct updates Note: to the drive parameter data, tempory storage made should be activated by the initialization procedure in the machine control. This mode insures that the write Cycle life of the Eeprom is not exceeded.

S-0-0269 - Attributes

ID number:	S-0-0269	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	DEC_0V	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/1	**Default value:**	0

S-0-0277, Position Feedback 1 Type Parameter

Description:

This parameter is used to determine the significant properties of the motor feedback (Position feedback 1).

For DKC the parameter will be set automatically by the drive.

Structure of the parameter:

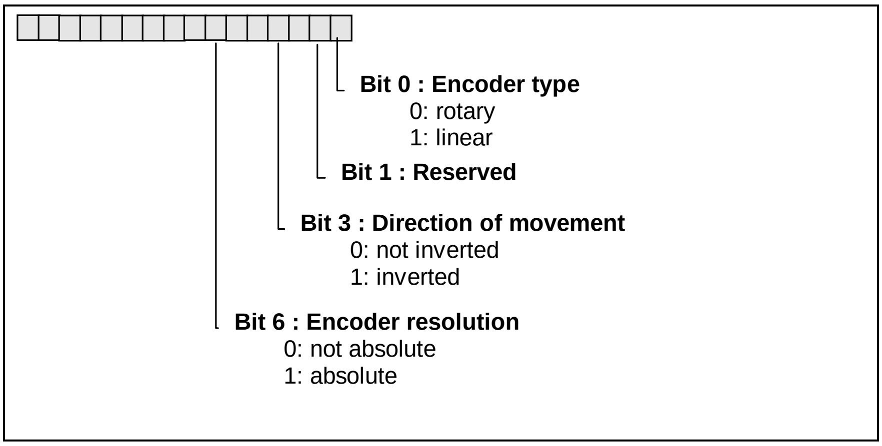


Fig. 2-17: S-0-0277, Position Feedback Parameter

Remark:

For absolute measurment systems with data memory, bit 6 will be set automatically.

When MDD and MKD motors are used, bit 0, 1, and 3 will be set and write protected by the drive.

Note: Only the bits named here are supported by the product

S-0-0277 - Attributes

ID number:	S-0-0277	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	0b

S-0-0298, Reference Cam Shifting

Description:

A reference switch from the drive can be utilized with drive controlled reference movement. For the relative position of the reference switch signal to the zero mark of the rotational feedback, there exists a optimum setting. In order for the installer to see the setup functionality during installation, the position of the reference switch to ideal point will be displayed within this parameter.

The display is dependent on the set position data scaling type (**S-0-0076, Position Data Scaling Type**) and is given in [mm], [grad] or [inch].

S-0-0298 - Attributes

ID number:	S-0-0298	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4 bytes	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0299, Home Switch Offset

Description:

If multiple reference marks of the homed measurement system are detectable during the travel motion of the shaft, then one of these marks must be selected as the relevant mark with the help of a zero switch.

The distance between the zero switch edge and reference mark may not be selected too small because the edge will eventually not be properly recognized and the next mark will be selected as a result.

A monitoring of the distances from edge to mark will be done with measurement systems with multiple reference marks with known and constant distances between each other.

The minimum allowed distance amount to ¼ * d where d equals the distance between the reference marks. The optimum distance amounts to ½ * d.

If the distance is smaller than ¼ * d, then the **S-0-0148, C6 Drive Controlled Homing Procedure Command** will be erroneously interrupted with the negative reception of **C602, distance zero switch reference mark**. The distance can then be changed mechanically or with the help of this parameter.

See also the functional description: "Drive controlled Homing Procedure"

S-0-0299 - Attributes

ID number:	S-0-0299	**Editability:**	P2,P3,P4
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

S-0-0331, Status Feedback = 0

Description:

This parameter sets an IDN for the "status feedback = 0"). The "status feedback = 0" is defined as a bit in class -3 diagnostics (IDN 0-0013) and is set when the velocity feedback value is found within the standstill window (IDN 00124).

Only bit 0 is defined in the operating data

The output "In motion" corresponds to this bit.

S-0-0331 - Attributes

ID number:	S-0-0331	**Editability:**	no
Function:	Parameter	**Memory:**	--
Data length:	2 Byte	**Validity check:**	--
Format:	binary	**Extreme value check:**	--
Unit English:	--	**Combination check:**	--
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0348, Proportional Gain Acceleration Feed Forward

Description:

The acceleration feed forward helps to reduce the following error during the acceleration phase in non-following error operation. The actual acceleration command value will be multiplied with the „proportional gain acceleration feed forward" and added with the current command value of the velocity controller.

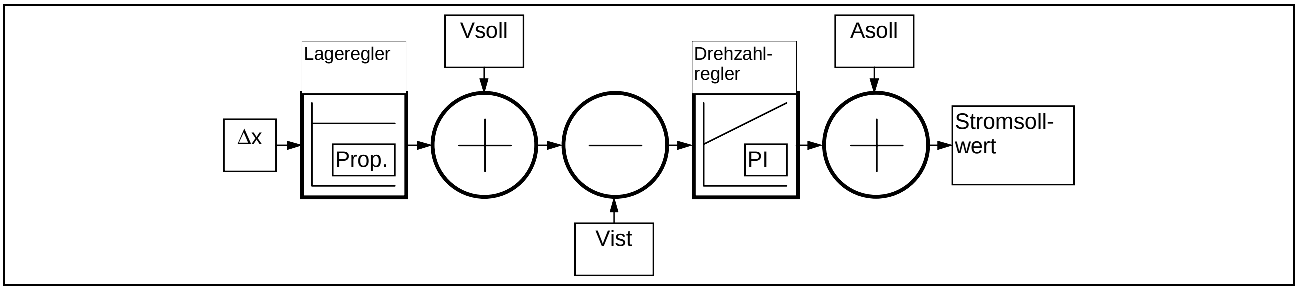


Fig. 2-3: Speed and acceleration pre-control

Activation:

A value larger than 0 will activate the acceleration feed forward during editing of the parameter!

Note: The controller functions withough precontrol as well! The standard value equals 0. Acceleration precontrol is only possible in lag-error free mode.

Comparison between the types of pre-control (feed forward)

The speed pre-control is activated by selecting an operating mode without lag distance. This creates (from the point of view of the position controller) a feedforward 1st order (speed). This means that at constant speed, the position deviation is 0. A lag distance results, nonetheless, during acceleration and deceleration.

The acceleration pre-control is activated by entering more than 0 for this parameter. It affects (from the point of view of the position controller), a feedforward 2nd order (proportional to acceleration). Position deviation is 0 if the correct value is selected and acceleration is constant.

The following guide value generally creates good control behavior.

$$S-0-0348=\frac{\text{moment of inertia}\left(kgm^2\right)}{\text{torque constant}\ (Nm/A)}*1000$$

(Factor 1000 needed for unit mA.)

Fig. 2-4: Acceleration precontrol P-gain

S-0-0348 - Attributes

ID number:	S-0-0348	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	mA(rad/s²)	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0 / 5006,5	**Default value:**	0

S-0-0390, Diagnostic Message Number

Description:

The number will be stored in the parameter "diagnostic message number" as well as the visual seven segment display. The controls will make it possible so that specific diagnostics with the aid of the diagnostic message number can be generated (for example in languages which are not stored as diagnostics in the drive).

Example:

Diagnostic Message:	"F8-22 Motor Feedback Error: signal is too small" in parameter S-0-0095
Seven Segment Display:	variable „F8" <=> „22"
Diagnostic message number:	"F822(hex)" in parameter S-0-0390

See also "**S-0-0095, Diagnostic Message**"

S-0-0390 - Attributes

ID number:	S-0-0390	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 bytes	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0392, Velocity Feedback Value Filter Time Base

Description:

A VZ1 filter will be used as the velocity feedback value filter. This filter time constant is adjusted within this parameter.

The filter is not active with values less than 500µsec.

S-0-0392 - Attributes

ID number:	S-0-0392	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	us	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	250/65500	**Default value:**	500

S-0-0393, Command Value Mode for Modulo Format

Description:

The interpretation of position command values such like **S-0-0047, Position Command Value** and**S-0-0258 Target Position** when the modulo function has been activated is dependent on the direction mode which has been selected.

The parameter **S-0-0393, Command Direction Mode for Modulo Format** exists for setting the mode.

This parameter is only functioning in the case where **S-0-0076, Position Data Scaling Type** had been activated in the modulo format.

The following values can be parametrized:

S-0-0393:	Meaning:
0	Shortest Path
1	Positive Direction
2	Negative Direction

Fig. 2-5: Parameterized Values

S-0-0393 - Attributes

ID number:	S-0-0393	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/2	**Default value:**	0

S-0-0400, Home Switch

Description:

This IDN is assigned to the home switch status (external signal) with this parameter.

Structure of the parameter

Bit 0 : Home switch
0: not activated
1: activated

Fig. 2-18: S-0-0400, Home Switch

S-0-0400 - Attributes

ID number:	S-0-0400	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

S-0-0403, Position Feedback Value Status

Description:

Bit 0 for this parameter will be set by the drive if the position feedback value, whose origin was selected in bit 3 from **S-0-0147, Homing Parameter** , is firmly referenced to the machine zero point.

If the commands **S-0-0148, Drive controlled homing procedure,** or **P-0-0012, Set absolute distance** are performed, the bit will be reset when they are started and then set 1 again once the command has been successfully completed.

The bit status position feedback value corresponds to the output "In reference".

Structure of the parameter:

Bit 0 : Position feedback value
0: are relative
1: applies to the machine zero point

Fig. 2-19: S-0-0403, Position Feedback Value Status

S-0-0403 - Attributes

ID number:	S-0-0403	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

3 Specific Product Parameters

P-0-0001, Diagnostic Message Number

Description:

The diagnostic message number will be stored in parameter P-0-0001, "Diagnostic message number" as well as the visual seven segment display.The controls generate specific diagnostics with the aid of the diagnostic message number (for example, diagnostics in additional languages not stored in the drive). The machine control may utilize the diagnostic number to generate its own specfic set of diagnostic messages.

Example:

Diagnostic Message:	„F822 Motor Feedback error:"Signals too small " in paramater S-0-0095
Seven Segment Display:	variable „F8" <=> „22"
Diagnostic message number:	„F822(hex)" in paramter P-0-0001

Note: Acts like **S-0-0390, diagnosis number.**

P-0-0001 - Attributes

ID number:	P-0-0001	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2Byte	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-0004, Smoothing Time Constant

Description:

The time constant that can be activated in this parameter acts at the output of the speed control and is suited for the suppression of the quantizing effect and limiting the band width of the speed control loop. Values of 0 and 500µs switch the filter off.

See also Function Description: "Setting the velocity loop"

P-0-0004 - Attributes

ID number:	P-0-0004	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	µs	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	500/65535	**Default value:**	500 ms

P-0-0005, Language Selection

Description:

Within the drive controller, parameter names, units and diagnostic/warning messages are collectively stored in more than one language. This parameter will establish in which language the text is to be issued.

- 0 :German
- 1 :English
- 2 : French
- 3 : Spanish
- 4 : Italian

Note: Acts like **S-0-0265, language switch**

P-0-0005 - Attributes

ID number:	P-0-0005	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/1	**Default value:**	--

P-0-0006, Overload Factor

Description:

The "overload factor" parameter value influences and determines the values for the torque releated drive parameters M_{max}, M_{KB} and the short duration torque percent duty cycle time, ED.

Increasing the overload factor corresponds to a reduction of the parameter values for:

- the percent duty cycle ED and
- the maximum peak torque M_{max}

Increasing the overload factor corresponds to an increase in the short duration torque Mkb.

$$\ddot{U}F \approx \frac{M_{KB}}{M_{dN}} \cdot 100\%$$

üF	=	P-0-00061
M_{KB}	=	Short period operational torque in Nm
MdN	=	Stand still torque in Nm

Fig. 3-1: Overload factor

P-0-0006 Attributes

ID number:	P-0-0006	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E2prom
Data length:	2Byte	**Validity check:**	Phase 3
Format:	DEC_0V	**Extreme value check:**	yes
Unit English:	%	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/500	**Default value:**	100 %

P-0-0009, Error Message Number

Description:

If an error ocurs during cyclic operation, then it will be diagnosed and displayed on a seven segment display.

At the same time, a bit will be set in **S-0-0011,** status class, and in the change bit for this status class in drive status word S-0-0135. The machine control can determine the queued error condition passed to the drives diagnostic display by reading this parameter, which contains only the three least significant decimals of the diagnostics message number, P-0-0001, (in range 201...899) and determine a specific error reaction or custom diagnostic text message.

If there is no an error then the value of this parameter is 0.

Example:

Queued error:	F822, "Motor feedback error signal amplitude error "
P-0-0009, error number	822

P-0-0009 - Attributes

ID number:	P-0-0009	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2Byte	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-0010, Excessive Position Command

Description:

The position-command-value monitor triggered error "F2-37, Excessive position command value difference", and decelerated the drive according to error handling defined in the **P-0-0119, Best Possible Deceleration** parameter.

The excessive position command value that triggered the error will be stored in parameter P-0-0010, the last valid position command value will be stored in the **P-0-0011, Last Valid Position Command Value** parameter.

Only command values preset by the NC will be monitored.

P-0-0010 - Attributes

ID number:	P-0-0010	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4 bytes	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

P-0-0011, Last Valid Position Command Value

Description:

If the error **F237, Excessive Position Command Value Difference** occurs, then the last valid position command value will be stored in this parameter.

P-0-0011 - Attributes

ID number:	P-0-0011	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4 bytes	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

P-0-0012, Command 'Set Absolute Measurement'

Description:

With the startup of an absolute measuring system, the drive will indicate a position feedback value that is arbitrary and does not reference the machine zero point. The value of the parameter **S-0-0403, Position feedback value status** will be 0.

Through the command "Set absolute measurement", the position feedback of this measuring system will be set on the desired value. After the end of the command "Set absolute measurement", the position feedback of the measurement supplied encoder bears a defined reference to the machine zero point.

By buffering all the required data of the absolute measuring system in the feedback data memory (eg parameter data memory), all information will be available once the system is re-booted. The position feedback permanently retains its reference to the machine zero point. All the required data for the absolute measuring sytem is either permanently in the feedback position data memory or in the drive parameter data memory, and is available after rebooting the drive system.

The parameter P-0-012 operates for the execution of this function.

See also Function Description: "Executing Parameter Commands"

P-0-0012 - Attributes

ID number:	P-0-0012	**Editability:**	P4
Function:	Command	**Memory:**	no
Data length:	2Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

P-0-0013, Command value mode for modulo format

Description:

The interpretation of the such position command values as **S-0-0047, Position command value** and **S-0-0258**, **Target position** with modulo function active is dependent on the mode set.

This parameter is functional only if **S-0-0076, scaling type position data** has been activated for modulo format.

The following value can be parameterized:

P-0-0013:	Meaning:
0 :	shortest path
1	positive direction
2	negative direction

Fig. 3-2: Parameter P-0-0013

WARNING

⇒ With the step motor interface only 0 = "shortest path" can be set

Note: Acts like **S-0-0393,** command value mode in modulo format

P-0-0013 - Attributes

ID number:	P-0-0013	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/2	**Default value:**	0

P-0-0018, Numbers of Motor Pole Pairs /Pole Pair Distance

Description:

With rotating motors, the number of pole pairs per motor revolution will be given.

This value is stored within the motor feedback data memory and must not be changed.

P-0-0018 - Attributes

ID number:	P-0-0018	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC-OV	**Extreme value check:**	no
Unit English:	Pair of poles or mm (dependent on P-0-4014, Motor type)		
Combination check:	no		
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/4	**Default value:**	--

P-0-0019, Position Start Value

Description:

The position start value serves the non-absolute measuring system through the paramaterization of a defined initialization value for position feedback value 1 S-0-0051.

The drive tests if the position start value has been specified in communication phases 2 or 3 during initialization of the position feedback. Only then will the position feedback value 1 be set to this value.The intial position value will only function with a single-turn-feedback.

P-0-0019 - Attributes

ID number:	P-0-0019	**Editability:**	P23
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

P-0-0020, Reference Cam Shifting

Description:

P-0-0020 is also referred to as “Displacement of the Home Switch”. During drive controlled homing (S-0-0148), the home switch is evaluated by the drive. An optimum location exists from the relative position where the home switch signals to the marker pulse of the motor feedback. In order to assist in the adjustment (positioning the mechanical cam) during the first start-up, the distance from the home switch cam to the optimum switch position is given in this parameter.

The value displayed is dependent on the selected set position data scaling type **(S-0-0076, position data scaling type)** and is displayed in [unit], [degree] or [inch].

Note: Acts like **S-0-0298,** shifting reference cam by **...**

P-0-0020 - Attributes

ID number:	P-0-0020	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

P-0-0038, Signal Selection for Analog Output Channel 1

Description:

Two outputs make it possible to read internal drive operational signals and output variables as analog voltage signals. Via an oscilliscope connection to the analog outputs, these signals can be queried. The maximum output voltage is + or - 10 volts with a definition of 8 bits. To select a specific signal, a predefined channel number is available. For the analog channel 1, the choice is indicated through the display of the channel selection number in the parameter P-0-0038.

The following predefined signals are available:

Number:	Signal choice:	Scaling:
0x0	zero point	0V
0x1	established torque output	P-0-0136
0x2	velocity feedback actual value	P-0-0040
0x3	S-0-0036, velocity command value	P-0-0040
0x4	position command value diff.	P-0-0040
0x5	S-0-0051, position value 1	P-0-0042
0x7	S-0-0189, gollowing error	P-0-0042
0x8	sine signal of motor feedback	1 : 1
0x9	cosine signal of motor feedback	1 : 1
0x12	torque producing current actual value	P-0-0136
0x13	magnetization current	P-0-0136
0X16	bleeder load	10V = 100%

Fig. 3-3: Possible analog outputs

The following scaling parameters should be considered:

- **P-0-0040 Scaling for velocity data on analog channel 1**
- **P-0-0042 Scaling for position data on analog channel 1**
- **P-0-0136, Scaling torque/force channel 1**

P-0-0038 - Attributes

ID number:	P-0-0038	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	1

P-0-0039, Signal Selection for Analog Output Channel 2

Description:

Two output channels make it is possible to read internal drive operational signals and output variables as analog voltage signals. Via an oscilliscope connection to the analog outputs, these signals can be queried. The maximum output voltage is + or - 10 volts with a definition of 8 bits. To select a specific signal, a predefined channel number is available. For the analog channel 2, the choice is indicated through the display of the channel number in parameter P-0-0039.

The following predefined signals are available:

Number:	Signal choice:	Scaling:
0x0	zero point	0V
0x1	established torque power	P-0-0137
0x2	velocity feedback actual value	P-0-0041
0x3	S-0-0036, velocity command value	P-0-0041
0x4	position command value difference	P-0-0041
0x5	S-0-0051, position value 1	P-0-0043
0x7	S-0-0189, following error	P-0-0043
0x8	sine signal of motor feedback	1 : 1
0x9	cosine signal of motor feedback	1 : 1
0x12	torque producing current actual value	P-0-0137
0x13	magnetization current	P-0-0137
0X16	bleeder load	10V = 100%

Fig. 3-4: Predefined signals

The following scaling parameters scaling should be considered:

- **P-0-0041 Scaling for velocity data on analog channel 2**
- **P-0-0043 Scaling for position data on analog channel 2**
- **P-0-0137, Scaling torque/force channel 2**

P-0-0039 - Attributes

ID number:	P-0-0039	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	2

P-0-0040, Scaling of Velocity Data on Analog Output Channel 1

Description:

By selecting numbers 2 or 3 in parameter **P-0-0038, Signal selection for analog output channel 1**, the scaling of velocity data evaluated will be established by parameter P-0-0040.

The unit of rpm/10V will always reference the motor.

P-0-0040 - Attributes

ID number:	P-0-0040	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC-OV	**Extreme value check:**	yes
Unit English:	Rpm/10V	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/65535	**Default value:**	3000 Rpm/10V

P-0-0041, Scaling of Velocity Analog Output-Channel 2

Description:

With the selections in the parameter **P-0-0039, signal select analog output channel 1**, the scaling will be established with parameter P-0-0041.

Thereby a unit of rpm/10V will always be established at the motor. An eventually existing operational translation will not be considered.

P-0-0041 - Attributes

ID number:	P-0-0041	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	Rpm/10V	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/65535	**Default value:**	3000

P-0-0042, Scaling for Position Data on Analog Output Channel 1

Description:

By selecting numbers 5 or 7 in parameter **P-0-0038, Signal selection for analog output channel 1**, the scaling of position data will be established in parameter P-0-0042.

The unit of degrees/10V reference the motor shaft.

P-0-0042 - Attributes

ID number:	P-0-0042	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	Deg/10V	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0,1/6553,5	**Default value:**	360,0

P-0-0043, Scaling for Position Data on Analog Output Channel 2

Description:

With the selection in parameter **P-0-0039, Signal selection for analog output channel 2**, the scaling of the position data will be established in parameter P-0-0043.

The unit of degrees/10V reference the motor shaft.

P-0-0043 - Attributes

ID number:	P-0-0043	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	Deg/10V	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0,1/6553,5	**Default value:**	360.0

P-0-0051, Torque Constant

Description:

The torque constant determines the driving torque of the motor given by a specific motor current.
With a synchronous motor, this value exclues motor construction.

The value is stored in the motor feedback memory and cannot be changed.

$$MA[Nm;N] = (P-0-0051) \cdot (P-0-0080)$$

MA:	Drive torque
P-0-0051	Torque constanst [N/A]
S-0-0080	Torque-power-command value [a

Formula 3-5: Drive torque

P-0-0051 - Attributes

ID number:	P-0-0051	**Editability:**	P3
Function:	Parameter	**Memory:**	Feedb.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	Nm/A	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0/1000	**Default value:**	--

P-0-0053, Lead drive position

Description:

The master axis position is determined at the incremental encoder output. Incremental encoder evaluation specifies the master axis position.

This parameter supports command value setting in speed and angle synchronization modes.

P-0-0053 - Attributes

ID number:	P-0-0053	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	Degree	**Combination check:**	no
Posit. after the dec.:	4	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	no

P-0-0083, Gear ratio adjustments

Description:

The transmission ratio of the electronic gearbox is changed by this per ent value.

This parameter is only active in speed synchronization. Once powered up, the value = 0, and the transmission value is not affected.

See also Function Description: "Speed synchronization"

P-0-0083 - Attributes

ID number:	P-0-0083	**Editability:**	P234
Function:	Parameter	**Memory:**	nein
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	%	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	-327,67/327,67	**Default value:**	--

P-0-0090, Travel Limit Parameter

Description:

The activation of the travel limit switches reaches in the parameter P-0-0090. In addition to this, one can invert the polarity of the signal input.

The drive response to a travel limit can be selected by testing it as either an error or as a warning.

Structure of the parameter:

Bit 0 : negation
0: E2/3 not inverted,
24 V => travel range exceeded
1: E2/3 inverted,
0 V => travel range exceeded

Bit 1 : activation
0: travel range limit switch is not active
1: travel range limit is active

Fig. 3-6: P-0-0090, Travel Limit Parameter

P-0-0090 - Attributes

ID number:	P-0-0090	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	BIN	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-0097, AbsoluteEncoderMonitoring Window

Description:

With the use of an absolute encoder, the drive memory data and actual feedback position value on the axis will be compared during the command to execut window 3 -> 4.

If the difference is larger than what is parameterized in parameter P-0-0097, the error message **F276, Absolute encoder error** will be generated**. This error indicates that the absolute position of the axis has changed since the last time it was removed from operating mode.**

As a default value, one can typically use 45 degrees with respect to the motor shaft if the axis is equipped with a holding (i.e., self-locking) brake.

P-0-0097 - Attributes

ID number:	P-0-0097	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0076	**Default value:**	30,00 Deg

P-0-0098, Maximum Model Deviation

Description:

Under the maximum model deviation, one can determine the maximum deviation between real position feedback and one calculated by a drive position feedback module.

The parameter can be read in the **Control window** by the user as an assist in the parameterization of **S-0-0159**.

Two cases must be distinguished for understanding and utilizing the position feedback module.

- **Pposition control allowing following error**

In this operating mode, the controlled system will be simulated with the help of a model.

The maximum deviation between the calculated position feedback module and the real position feedack will be stored in parameter P-0-0098.

The control system model, in this case, represents a first order feedback system which is only dependent on the Kv-factor of the position controller.

- **Position control without following error**

In this operating type, the position command will be compared with the position feedback.The maximum deviation occurring will be stored in P-0-0098.

A model for the control system is not necessary in this case.

Note: The parameter is only descriptive. It can, for example, be reset to 0.

P-0-0098 - Attributes

ID number:	P-0-0098	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	0/S-0-0076	**Default value:**	--

P-0-0108, Lead drive polarity

Description:

This parameter can invert master drive position polarity. This means that an inverted, electronic gearbox can be implemented.

Parameter structure:

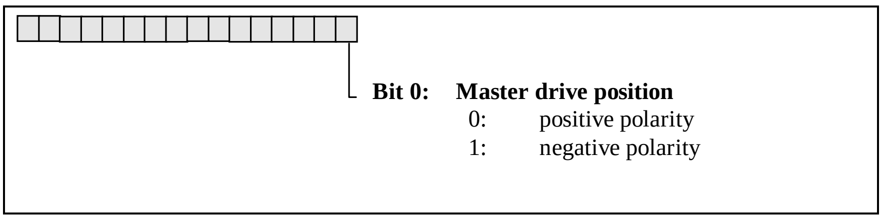


Fig.: 3-1: P-0.0108, Lead Drive Polarity

See also Function Description: "DKC01.1 with speed and angle synchronization"

P-0-0108 - Attributes

ID number:	P-0-0108	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/1	**Default value:**	--

P-0-0109, Torque/Force Peak Limit

See also Function Description: "Torque Limits"

P-0-0109 - Attributes

ID number:	P-0-0109	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	S-0-0086	**Combination check:**	no
Posit. after the dec.:	S-0-0086	**Cyc. transmittable:**	no
Input value min / max:	0 / S-0-0086	**Default value:**	500,0

P-0-0119, Error Reaction - best possible braking

Description:

This parameter specifies drive braking to standstill following :

- non-fatal error
- interface error
- switching off of the controller enable signal

P-0-0119:	Reaction type:
0	Velocity command is set to zero, i.e., the motor will be braked under control of the bipolar torque limit parameter value. The braking **time** may amount to a maximum of 500ms. 100 milliseconds before the actuation of brake time, the holding brake will be activated. Should the velocity already have fallen below the value of "S-0-0124 Standstill window", the holding brake will be immediately activated . After 500ms, the motor is torque free .
1	Switch to torque free state

Fig. 3-7: Reaction types

The controller enable can be closed again, at the earliest, after the operation of the error reaction. The drive will ignor the controller enable input until the error reaction operation of the drive is completed.

P-0-0119 - Attributes

ID number:	P-0-0119	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/1	**Default value:**	0

P-0-0123, Absolute Encoder Buffer

Description:

In this parameter all the data necessary for the initialization of position by the absolute encoder is secured.

P-0-0123 - Attributes

ID number:	P-0-0123	**Editability:**	no
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2Byte variable	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-0136, Scaling Torque/Force Channel 1

Description:

If torque data is selected with parameter **P-0-0038, Signal selection for analog channel 1**, then parameter **P-0-0136** can be used to determine scaling for this data.

The unit for P-0-0136 is A/10V = current/full amplitude.

For example, if 40.0 A/10V is given, then the analog signal will have a scaling of 4 A/V.

S-0-0136 - Attributes

ID number:	P-0-0136	**Editability:**	234
Function:	Parameter	**Memory:**	Prog.Module
Data length:	2 bytes	**Validity check:**	no
Format:	DEC_0V	**Extreme value check:**	yes
Unit in Ger./Eng.:	A/10V / A/10V	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input min/max:	0.1/6553.5	**Default value:**	ITYP

P-0-0137, Scaling Torque/Force Channel 2

Description:

If torque data is selected with parameter **P-0-0039, Signal selection for analog channel 2**, then parameter **P-0-0137** can be used to determine scaling for this data.

The unit for P-0-0137 is A/10V = current/full amplitude.

For example, if 40.0 A/10V is given, then the analog signal will have a scaling of 4 A/V.

S-0-0137 - Attributes

ID number:	P-0-0137	**Editability:**	P234
Function:	Parameter	**Memory:**	Prog.Module
Data length:	2 bytes	**Validity check:**	no
Format:	DEC_0V	**Extreme value check:**	yes
Unit in Ger./Eng.:	A/10V / A/10V	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input min/max:	0.1/6553.5	**Default value:**	ITYP

P-0-0139, Analog Output 1

Description:

If analog output 1 (P-0-0139) has been selected with parameter

- **P-0-0038 Signal selection for analog output channel 1** or
- **P-0-0039 Signal selection for analog output channel 2**,

the content of parameter P-0-0139 will be sent to analog output channel 1 or 2.

Only values between -128 and +127 are possible. They will be converted to +/-10V at a ratio of 1:1.

S-0-0139 - Attributes

ID number:	P-0-0139	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	2 bytes	**Validity check:**	no
Format:	DEC_0V	**Extreme value check:**	yes
Unit in Ger./Eng.:	0.078V/0.078V	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input min/max:	-128/127	**Default value:**	--

P-0-0140, Analog Output 2

Description:

If analog output 1 (P-0-0140) has been selected with parameter

- **P-0-0038 Signal selection for analog output channel 1** or
- **P-0-0039 Signal selection for analog output channel 2**,

the content of parameter P-0-0140 will be sent to analog output channel 1 or 2.

Only values between -128 and +127 are possible. They will be converted to +/-10V at a ratio of 1:1.

S-0-0140 - Attributes

ID number:	P-0-0140	**Editability:**	P234
Function:	Parameter	**Memory:**	no
Data length:	2 bytes	**Validity check:**	no
Format:	DEC_0V	**Extreme value check:**	yes
Unit in Ger./Eng.:	0.078V/0.078V	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input min/max:	-128/127	**Default value:**	--

P-0-0142, Synchronization Acceleration

Description:

Acceleration or deceleration with which the synchronous velocity is accepted in dynamic synchronization (Ramp up and lock on).

When running an angle offset, the following drive is either accelerated or decelerated with synchronization acceleration.

See also Function Description: "DKC01.1 with speed and angle synchronization"

P-0-0142 - Attributes

ID number:	P-0-0142	**Editability:**	P2,P3,P4
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	S-0-0160	**Extreme value check:**	yes
Unit English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	no
Input value min / max:	>0/S-0-0160	**Default value:**	1000,000

P-0-0143, Synchronization Velocity

Description:

The velocity that leads to absolute synchronization in dynamic synchronization (ramp up and lock on).

See also Function Description: "DKC01.1 with speed and angle synchronization"

P-0-0143 - Attributes

ID number:	P-0-0143	**Editability:**	P2,P3,P4
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	S-0-0044	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	no
Input value min / max:	>0/S-0-0044	**Default value:**	10,0000

P-0-0151, Synchronization Init Window for Modulo Format

Description:

The second step of dynamic synchronization (ramp up and lock on) establishes a path that must be crossed to reach absolute synchronization.

If positioning difference exceeds "synchronization window in modulo format P-0-0151“, then the synchronization direction is determined by parameter „command value in modulo format“ (S-0-0393). If the position difference is smaller than the the value in „seynchronization window in modulo format“, then synchronization may take place in a direction counter to the oneset in parameter S-0-0393.

In synchronization window parameter, the position difference as it releates to the following drive is entered, within which the rotational direction may deviate from the one set for synchronization.

See also Function Description: "DKC01.1 with speed and angle synchronization"

P-0-0151 - Attribute

ID number:	P-0-0151	**Editability:**	P2, P3, P4
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4Byte	**Validity check:**	Phase3
Format:	S-0-0076	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	10,00

P-0-0152, Evaluating analog gear adjustment

Description:

Adjustment relates to the changes in the set transmission ratio. This parameter describes the change in gear ratio with an input voltage of 10V.

See also Function Description: "DKC01.1 with speed and angle synchronization"

P-0-0152 - Attributes

ID number:	P-0-0152	**Editability:**	P2,P3
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	% / 10V	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/327	**Default value:**	100

P-0-0162, D9 Automatic control loop setting

Description:

Starting this command executes an automatic control loop setting in the drive as soon as the drive is in the loop with command start.

WARNING

⇒ This can effect an immediate motion if **drive enable** and **drive start** are applied to the drive.

⇒ The drive now conducts autonomous motions within the traversing range defined by both limits.

The two traverse range limits (P-0-0166 and P-0-0167), within which the drive may move during autoatic control loop settings, must be set first.

All pre-settings affecting the command, such as **P-0-0163**, damping factor for automatic control loop settings, **P-0-0164, application for autom. control loop setting, S-0-0092, bipolar torque/force limit value** and **S-0-0259, positioning speed** must also first be set.

Note: **Errors** can occur during the execution of a command. These must be signalled with pertinent messages.
D901 start only with drive enable possible
D902 motor feedback data does not make sense
D903 faulty determination of moment of inertia
D904 automatic control loop setting failed
D905 traverse range limit not valid
D906 traverse range limit exceeded

See also Function Description: "Precondition for starting the automatic control loop setting"

P-0-0162 - Attributes

ID number:	P-0-0162	**Editability:**	P4
Function:	command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	BIN	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

P-0-0163, Damping factor for automatic control loop setting

Description:

At this point, the user has the option to influence the automatic control loop dynamics. The slide switch in DriveTop dialog "**Automatic control loop setting"** is intended for this purpose.

A dynamics = 100% achieves the maximum possible drive dynamics.

A dynamics = 0% results in a highly non-dynamic control loop setting.

Note: **It applies**: large damping factor P-0-0163 = 20 ⇒ 0% dynamics
small damping factor P-0-0163 = 0.5 ⇒ 100% dynamics

Function Description

If dynamics are selected greater than that which the drive can achieve as a result of its mechanical construction, then a weakly damped control loop will result and the drive will begin to oscillated.

This drive itself, in a case like this, detects and influences the control parameters **automatically** until a **sufficiently damped** control loop setting is achieved.

Note: Generally speaking, presetting a default value of 88% (P-0-0163 = 3.0) produces satisfactory results.

See also Function Description: "Precondition for starting the automatic control loop setting"

P-0-0163 - Attributes

ID number:	P-0-0163	**Editability:**	P2, P3, P4
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0.5/20.0	**Default value:**	--

P-0-0164, Automatic control loop setting applications

In order to take control strategies related to an application into consideration with the automatic control loop settings, the user receives a **selection list** from which the desired application can be selected.

This offers, e.g., the option to completely switch the I-gain off, for example, and so on.

The information below relates to the speed controller

Value (P-0-0164)	Application	I-gain	P-gain
0	machine tools --> good load rigidity	with	normal
1	nippel machine --> short settling times	w/o Tn=0ms	big
2	simultaneously running separation device -> rel. undynam. control loop setting	w/o Tn=0ms	normal

Fig. 3-2: Speed controller data

Note: This table is constantly expanded and is presently incomplete.

A **default value** for a **machine tool** was set.

See also Function Description: "Precondition for starting the automatic control loop setting"

P-0-0164 - Attributes

ID number:	P-0-0164	**Editability:**	P2, P3, P4
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/3	**Default value:**	0

P-0-0165, Optional parameter for automatic control loop setting

Description:

Note: Parameter is required with later versions.

P-0-0165 - Attributes

ID number:	P-0-0165	**Editability:**	P2,P3,P4
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/100 b	**Default value:**	0

P-0-0166, Lower traversing limit for automatic control loop setting

Description:

The lower traversing limit for the automatic control loop setting **P-0-0162** is stored here. A **Teach-In function** in Drivetop is used to approach the limit position in either a speed controlled fashion or in jog mode. Pressing the Teach-In key copies the **current actual position** as **lower limit** into the operating data of parameter P-0-0166.

Note:

At the start of command D9, a check is run of the traversing range defined by both parameters (P-0-0166 and P-0-0167).

See also **D905 wrong position range**

See also **D906 position range exceeded**

P-0-0166 - Attributes

ID number:	P-0-0166	**Editability:**	P2, P3, P4
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	during D9
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

P-0-0167, Upper traversing range for automatic control loop setting

Description:

The upper traversing limit for the automatic control loop setting **P-0-0162** is stored here. A **Teach-In function** in Drivetop is used to approach the limit position in either a speed controlled fashion or in jog mode. Pressing the Teach-In key copies the **current actual position** as **lower limit** into the operating data of parameter P-0-0167.

Note:

At the start of command D9, a check is run of the traversing range defined by both parameters (P-0-0166 and P-0-0167).

See also **D905 wrong position range**

See also **D906 position range exceeded**

P-0-0167 - Attributes

ID number:	P-0-0167	**Editability:**	P2, P3, P4
Function:	Parameter	**Memory:**	no
Data length:	4Byte	**Validity check:**	during D9
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	0

P-0-0168, Maximum Acceleration

Description:

The maximum possible acceleration for the drive in use is displayed in this parameter's data field.

The value is closely approximate to being indirectly proportional to the drive's total moment of inertia (motor plus load) and directly proportional to the peak torque of the drive.

This maximum value is determined when controller values are automatically set, **P-0-0162** and is used as a **default value** for determining the **positioning commands.**

The numeric value 0 is entered as a **default value** to make it obvious that the parameter has not yet been set to a valid value.

P-0-0168 - Attributes

ID number:	P-0-0168	**Editability:**	P2,P3,P4
Function:	Parameter	**Memory:**	no
Data length:	4 bytes	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit in English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	no
Input min/max:	0/S-0-0160	**Default value:**	0

P-0-0500, Velocity Command Voltage for Max. Motor Speed

Description:

Parameter for setting the scale factor of the analog velocity command value. Along with parameter P-0-501, the scaling for the velocity command value is determined :

P-0-0501, Motor speed for maximum velocity command voltage [Rpm]

P-0-0500, Velocity command voltage for Max. motor speed [V]

$$validity\ \ of\ \ the\ \ analog\ \ velocity\ \ command\ \ value = \frac{P-0-0501}{P-0-0500}$$

Fig. 3-8:Scale factor of the analog velocity command value

P-0-0500 - Attributes

ID number:	P-0-0500	**Editability:**	P2
Function:	Parameter	**Memory:**	Param. E²Prom
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	V	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	1/10,0	**Default value:**	10,0 V

P-0-0501, Motor Speed for Maximum Velocity Command Voltage

Description:

Parameter for setting the scale factor of the analog velocity command value. Along with the parameter P-0-501, the scaling for the velocity command value is determined :

P-0-0501, motor speed for maximum velocity command voltage [Rpm]

P-0-0500, Velocity command voltage for max. motor speed [V]

P-0-0501 - Attributes

ID number:	P-0-501	**Editability:**	no
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	rpm	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/30000	**Default value:**	3000

P-0-0502, Line Count for the Incremental Encoder

Description:

If the actual position value output is selected for incremental encoder emulation, then the line count of the incremental encoder must be set.

P-0-0-502 - Attributes

ID number:	P-0-0502	**Editability:**	no
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	4 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	1/65536	**Default value:**	1250

P-0-0503, Reference Pulse Offset

Description:

With this parameter, the position of the reference pulse of the emulated incremental encoder output can be shifted.

P-0-0503 - Attributes

ID number:	P-0-0503	**Editability:**	no
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	Degree	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0/359,9	**Default value:**	0

P-0-0504, Command Filter Smoothing Time Constant

Description:

The analog velocity command value is filtered according to the recorded time constant.

The filter can be switched off with input value 0 or 0.5ms.

P-0-0504 - Attributes

ID number:	P-0-0504	**Editability:**	no
Function:	Parameter	**Memory:**	Param. E²Prom
Data length:	4 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	ms	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0.5/1000.00	**Default value:**	5.00

P-0-0508, Commutation Offset

Description:

This parameter, with synchronous motors, gives the offset between raw value of the rotational feedback and the resulting absolute electrical angle between the stator current vector and the rotor flux vector.

The commutator offset is stored in the motor feedback data memory and does not need to be entered.

P-0-0508 - Attributes

ID number:	P-0-0508	**Editability:**	no
Function:	Parameter		
Memory:	Param.E²prom, Feedb. E²Prom		
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/10000	**Default value:**	--

P-0-0510, Moment of Inertia of the Rotor

Description:

This parameter gives the moment of inertia of the rotor without load and is stored in the feedback of motors with feedback memory.

P-0-0510 - Attributes

ID number:	P-0-0510	**Editability:**	no
Function:	Parameter		
Memory:	Param.E²prom, Feedb. E²Prom		
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	kgm²	**Combination check:**	no
Posit. after the dec.:	5	**Cyc. transmittable:**	no
Input value min / max:	0/1,00000	**Default value:**	--

P-0-0511, Brake Current

Description:

The parameter is not operational in DKC01/DKC1.1.

P-0-0511 - Attributes

ID number:	P-0-0511	**Editability:**	no
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0/500,000	**Default value:**	0.000A

P-0-0512, Default Position Loop Kv-factor

Description:

Default value for the position loop proportional gain. This parameter is determined on site at the manufacturer's and cannot be changed. The “Load default parameters” command will copy the value of this parameter to parameter S-0-0104, position loop Kv factor.

P-0-0512 - Attributes

ID number:	P-0-0512	**Editability:**	no
Function:	Parameter	**Memory:**	Feedb. E²prom
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	1000/min	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0,01/327,67	**Default value:**	1.00 1000/min

P-0-0513, Feedback Type

Description:

This value is available in all measuring systems with feedback data memory and diagrammed next to the control analysis of important properties of the measuring system. The drive dealer sets parameter coding.

The parameter is not describable and serves exclusively the information of the connected feedback.

With motors with single turn resolver, the value is = 0.

With motors with multi turn resolver, the value is = 16.

P-0-0513 - Attributes

ID number:	P-0-0513	**Editability:**	no
Function:	Parameter	**Memory:**	Feedb.-E²prom
Data length:	2 Byte	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/100	**Default value:**	--

P-0-0514, Absolute Encoder Offset

Description:

The parameter function for the initializing position of the absolute encoder.

P-0-0514 cannot be edited.

P-0-0514 - Attributes

ID number:	P-0-0514	**Editability:**	no
Function:	Parameter	**Memory:**	Feedb.-E²prom
Data length:	4 Byte	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit English:	Inkr.	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-0515, Home(Reference) Position

Description:

Reference position for the SSI emulation.

Here the position in degrees will be placed on the motor which should be read after the „absolute measurement emulator setting" from the SSI emulator.

P-0-0515 - Attributes

ID number:	P-0-0515	**Editability:**	P2
Function:	Parameter		
Memory:	Parameter EEProm		
Data length:	4 Byte	**Validity check:**	yes
Format:	DEC_MV	**Extreme value check:**	yes
Unit English:	Degree	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0/1474559,99	**Default value:**	0

P-0-0516, Feedback Interface

Description:

This parameter has no meaning with DKC.

P-0-0516 - Attributes

ID number:	P-0-0516	**Editability:**	--
Function:	Parameter	**Memory:**	fixed
Data length:	2 Byte	**Validity check:**	yes
Format:	binary	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	0/100	**Default value:**	0

P-0-0518, Amplifier Nominal Current-2

Description:

The parameter specifies the maximum nominal current of the amplifier with reduced peak current.

It specifies within the parameters **S-0-0110, amplifier peak current, S-0-0112, amplifier nominal current** and **P-0-0519, amplifier peak current-2**, the length of the peak current characteristics for the peak current limit of the amplifier.

The value is not editable because it is permanently programmed within the amplifier.

P-0-0518 - Attributes

ID number:	P-0-0518	**Editability:**	no
Function:	Parameter	**Memory:**	Verst.-E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0,001/500	**Default value:**	--

P-0-0519, Amplifier Peak Current-2

Description:

The drive offers the possibility of a changed length of peak current characteristic with reduced amplifier peak current and is therefore defined as a increased amplifier length current.

The parameter P-0-0519 specifies a amplifier peak current for this case.

It serves for the determination of the functioning points on the length of the peak current characterisic.

The value of this parameter is not editable because it is permantently programmed in the amplifier.

P-0-0519 - Attributes

ID number:	P-0-0519	**Editability:**	no
Function:	Parameter	**Memory:**	Verst.-E²prom
Data length:	4 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0,001/500	**Default value:**	--

P-0-0520, Hardware Number

Description:

Parameter for identification of the hardware.

The parameter is determined during the manufacturing stage and cannot be changed.

S-0-0520 - Attributes

ID number:	P-0-0520	**Editability:**	not editable
Function:	Parameter		
Memory:	Amplifier EEProm		
Data length:	2 Byte	**Validity check:**	no
Format:	decimal	**Extreme value check:**	no
Unit English:	none	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-0522, Absolute Encoder Count Direction

Description:

WIth this parameter, the operational direction of the absolute encoder emulation will be set. If the parameter = 1 is set then the operation direction will be inverted. That means the SSI interface receives a given position value for the rotation of the motor in clockwise/counterclockwise direction. With the change of the operational direction, the new command „absolute measurement emulator setting" must be processed through so that the given position will be changed through the inversion.

P-0-0522 - Attributes

ID number:	P-0-0522	**Editability:**	P2/P3
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	0/1	**Default value:**	--

P-0-0539, Emulated absolute encoder position

Description:

This is purely a display value of the SSI emulated position indicated in degrees.

P-0-0539 - Attribute

ID number:	P-0-0539	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	Degree	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-1003, Velocity Feedback Value Filtertimebase

Description:

The velocity feedback value filter will be used as a VZ1 low pass filter.This filter time constant is adjusted within this parameter.

The filter is not effective if input is smaller equal to 500µsec.

See also Function Description: "Setting the velocity loop"

Note: Acts like **S-0-0392, actual speed value filter**

P-0-1003 - Attributes

ID number:	P-0-1003	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	µs	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	500/65535	**Default value:**	1500

P-0-1222, Command Value Smoothing Time Constant

Description:

This parameter is only active during speed synchronization. The speed command value for the speed controller of the following drive is generated from the master axis position. It can be smoothed with the use of PT-1 filter.

P-0-1222 - Attributes

ID number:	P-0-1222	**Editability:**	P234
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	µs	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/65535	**Default value:**	500

P-0-4000, Current Zero Trim Phase U

Description:

This parameter serves the display of the determined result of the zero trim procedure of the current feedback sensor of the U phase.

P-0-4000 - Attributes

ID number:	P-0-4000	**Editability:**	no
Function:	Parameter	**Memory:**	Verst..-E²prom
Data length:	2 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	%	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	-100,00/100,00	**Default value:**	--

P-0-4001, Current Zero Trim Phase V

Description:

This parameter serves the display of the determined result of the zero trim procedure of the current feedback sensor of the V phase.

P-0-4001 - Attributes

ID number:	P-0-4001	**Editability:**	no
Function:	Parameter	**Memory:**	Verst..-E²prom
Data length:	2 Byte	**Validity check:**	no
Format:	DEC_MV	**Extreme value check:**	no
Unit English:	%	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	-100,00/100,00	**Default value:**	--

P-0-4002, Current Amplify Trim Phase U

Description:

For trimming of the current sensors regarding its amplifier error, this parameter will specify testing areas with DKC devices.

P-0-4002 - Attributes

ID number:	P-0-4002	**Editability:**	no
Function:	Parameter	**Memory:**	Verst.-E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	4	**Cyc. transmittable:**	no
Input value min / max:	0,0001/2,0000	**Default value:**	--

P-0-4003, Current Amplify Trim Phase V

Description:

For trimming of the current sensors regarding the amplifier error, this parameter will specify the test field for DKC drives.

P-0-4003 - Attributes

ID number:	P-0-4003	**Editability:**	no
Function:	Parameter	**Memory:**	Verst.-E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	4	**Cyc. transmittable:**	no
Input value min / max:	0.0001/2.0000	**Default value:**	--

P-0-4004, Magnetization Current

Description:

In this parameter, someone from Indramat will install the set nominimal or servo magnetization current for asynchronous motors.

With synchronous motors, this parameter will automatically be set to 0.

As the DKC controller can only be operated in conjunction with MKD or MDD synchronous motors, this parameter is not relevant in this case.

P-0-4004 - Attributes

ID number:	P-0-4004	**Editability:**	P23
Function:	Parameter	**Memory:**	fixed
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	4	**Cyc. transmittable:**	no
Input value min / max:	0/400000	**Default value:**	0

P-0-4006, Process Block Target Position

Description:

List of the target positions for the command operated function (positioning interface).It can be given a maximum of 64 position values whereby the first elemet specifies the target position of the process block 0 and the second position specifies the target position of the second process block 1...

The number of the target positions must always be larger or equal to the number of the operational process block.If process block are selected of which there are no target positions, then the warning „non-programmed process block" will be given.

P-0-4006 - Attributes

ID number:	P-0-4006	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	list with 64 elements each with 4 Byte, 256 Byte		
Validity check:	yes		
Format:	S-0-0076	**Extreme value check:**	yes
Unit English:	S-0-0076	**Combination check:**	no
Posit. after the dec.:	S-0-0076	**Cyc. transmittable:**	no
Input value min / max:	S-0-0076	**Default value:**	--

P-0-4007, Process Block Velocity

Description:

List of the process block velocity for command controled operation (positioning interface).It can be given a maximum of 64 velocities whereby the first element specifies the maximum velocity of the process block 0, the second element specifies the maximum velocity of the process block 1...

The number of the process block velocities must always be larger or equal to the number of operational process block.If process blocks is selected of which there are no process block velocities, then the warning **"non-programmed process block"** will be given.

P-0-4007 - Attributes

ID number:	P-0-4007	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	list with 64 elements each with 4 Byte, 256 Byte		
Validity check:	yes		
Format:	S-0-0044	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	no
Input value min / max:	S-0-0044	**Default value:**	100,0000

P-0-4008, Process Block Acceleration

Description:

List of the acceleration for the command controled operation (positioning interface).It can be given a maximum of 64 acceleration values whereby the first element specifies the maximum acceleration of the process block 0, the second element specifies the maximum acceleration of the process block 1....

The number of accelerations must always be larger or equal to the number of operation process blocks.If process blocks are selected of which there are no acceleration, then the warning „**non-programmed method operation**" will be given.

P-0-4008 - Attributes

ID number:	P-0-4008	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	list with 64 elements each with 4 Byte, 256 Byte		
Validity check:	yes		
Format:	decimal	**Extreme value check:**	yes
Unit English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	no
Input value min / max:	S-0-0160	**Default value:**	1000,000

P-0-4009, Process Block Jerk

Description:

List of the jerk limit value for command controlled operation (positioning interface).It can be given a maximum of 64 jerk limit values whereby the first element specifies the jerk limit value of the process block 0, the second element specifies the jerk value of the process block 1....

The number of the jerk limit values must be larger or equal to the number of operation process blocks.If process blocks are selected of which there are no jerk limit values, then the warning „non-programmed process block" will be given.

With an input of 0, the jerk limitation can be turned off.

P-0-4009 - Attributes

ID number:	P-0-4009	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	yes
Data length:	list with 64 elements each with 4 Byte, 256 Byte		
Validity check:	yes		
Format:	Parameter	**Extreme value check:**	no
Unit English:	S-0-0160	**Combination check:**	no
Posit. after the dec.:	S-0-0160	**Cyc. transmittable:**	no
Input value min / max:	S-0-0160	**Default value:**	0

P-0-4010, Load Inertia

Description:

The load moment of inertia determined with the automatic control loop setting is entered in this parameter without **P-0-0510, rotor moment of inertia.** This is important when optimizing the speed control loop. The inertia relates to the motor and is rotary in nature.

P-0-4010 - Attributes

ID number:	P-0-4010	**Editability:**	P234(always)
Function:	Parameter	**Memory:**	Param.-E²prom
Data length:	4 Byte	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	kg m²	**Combination check:**	no
Posit. after the dec.:	5	**Cyc. transmittable:**	no
Input value min / max:	0/21474.83647	**Default value:**	0

P-0-4011, Switch Frequency

Description:

With this parameter, the switch frequency of the pulse switching controler can be set to the value of 4 and 8 kHz.

P-0-4011 - Attributes

ID number:	P-0-4011	**Editability:**	P23
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	kHz	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	4/8	**Default value:**	4

P-0-4014, Motor Type

Description:

With this parameter, the motor type will be selected. The parameter is not changeable because the operation of synchronous motors is only possible.

- 1:Synchronous motor

P-0-4014 - Attributes

ID number:	P-0-4014	**Editability:**	no
Function:	Parameter	**Memory:**	Param.E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/5	**Default value:**	--

P-0-4015, Circle Voltage

Description:

The circle voltage is stored as a parameter in the amplifier.

The parameter is not editable and serves only the display as well as internal calculations (PWM).

P-0-4015 - Attributes

ID number:	P-0-4015	**Editability:**	no
Function:	Parameter	**Memory:**	Verst.-E²prom
Data length:	2 Byte	**Validity check:**	Phase3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	V	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	1/1000	**Default value:**	--

P-0-4017, Offset of the Analog Torque Command

Description:

This parameter is only active in "Torque control" mode. An offset of the analog torque command value can be set. An available offset which lies in the signal path of the analog signal can be regulated.

P-0-4017 - Attributes

ID number:	P-0-4017	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	mV	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	-10000/+10000	**Default value:**	0

P-0-4018, Offset of the Analog Velocity Command Input

Description:

This parameter is only active in "Speed control with analog command value" active. An offset of the analog speed input can be set. An available offset which lies in the signal path of the analog signal can be regulated.

P-0-4018 - Attributes

ID number:	P-0-4018	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	mV	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	-10000/+10000	**Default value:**	0

P-0-4019, Process Block Mode

Description:

Setup of the process block mode („relative process block," „absolute process block,"„movement in positive direction" or „movement in negative direction") for each seperate process block.The first element of this list specifies the mode of the process block 0, the second specifies the mode of the process block 1.

process mode	Setup value
Absolute process block	1 h
relative process block without res. path storage	2 h
relative process block with res. path storage	102 h
Movement in positive direction	4 h
Movement in negative direction	8 h
following block with target position without halt (mode 1)	10 h
following block with target position without halt (mode 2)	20 h
following block with target position with halt	40 h
following block with transition at switching signal	80 h

Fig. 3-9: Adjustable process block modes

The number of process block modes must always be larger or equal to the number of operation process blocks.If process blocks are selected of which there are no process modes, then the warning „non-programmed process block" will be given.

See also Function Description "Positioning Operation"

P-0-4019- Attributes

ID number:	P-0-4019	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	list with 32 elements each with 4 Byte, 64 Byte		
Validity check:	yes		
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	1

P-0-4020, Encoder Emulation Type

Description:

Setup, if incremental or absolute feedback position output should be reached. With incremental encoder emulation, there is a choice between outputting position command values and actual position vaues.

Feedback positional output	P-0-4020
incremental encoder emulation of the actual pos. value	001 b
incremental encoder emulatoin of the position command value	101 b
Absolute control emulation (SSI-emulation)	010 b
no output	000 b

Fig. 3-10: Control emulation types

P-0-4020-Attributes

ID number:	P-0-4020	**Editability:**	P2
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	-	**Cyc. transmittable:**	no
Input value min / max:	0/2	**Default value:**	1

P-0-4021, Baud - Rate (RS232/485)

Description:

There can be different baud rates set for the communication over the serial interface.

Baud rate [Baud]	Setting in parameter P-0-4021
9600	0
19200	1

Fig. 3-11: adjustable baud rates

Note: Do not change the baud rates in the list of all parameters in DriveTop as this would lockout all further communications in DriveTop version < 3.

See also Function Description: "Communication Parameters"

P-0-4021 Attributes

ID number:	P-0-4021	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	-	**Cyc. transmittable:**	no
Input value min / max:	0/3	**Default value:**	0

P-0-4022, Drive Address

Description:

When communicating via RS485-interface with more than one drive, each drive must have different addresses so that only the addressed drive reacts.

Addresses can be set from 0 to 99.

The selection of the drive with the desired address is successful in a terminal program through BCD: Drive Address.

See also Function Description: "Communication Parameters"

P-0-4022 Attributes

ID number:	P-0 4022	**Editability:**	P2
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	0/99	**Default value:**	1

P-0-4023, C4 Command: Switch to Parameter Mode

Description:

Switching command from drive mode (i.e., out of phase 3 (P3)) into parameter mode (Phase 2(P2)).

The command can only be processed if the control opening is turned off.

See also Function Description: "Communication Parameters"

P-0-4023-Attributes

ID number:	P-0-4023	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	binary	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

P-0-4024, Test Status

Description:

Supports information about product advancement in operation.

P-0-4024-Attributes

ID number:	P-0-4024	**Editability:**	-
Function:	Parameter	**Memory:**	Amplifier E²Prom
Data length:	2 Byte	**Validity check:**	yes
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	-	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	no

P-0-4025, Password

Description:

Acts like **S-0-0267, password**

P-0-4025-Attributes

ID number:	P-0-4025	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	0 byte-maximum 10 symbols		
Validity check:	yes		
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-4026, Process Block Selection

Description:

With this parameter, it can be read from „drive stop" which of the input signals P1 to P5 is the selected process block. If the device finds itself in „device opening(AF)", then the number of the positioning command, which immediately will be worked on, can be read here. If bit 5 is set in parameter **P-0-4027, function parameter,** then the process block can be pre-selected in this parameter via the serial interface.

P-0-4026-Attributes

ID number:	P-0-4026	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	0/31	**Default value:**	--

P-0-4027, Function Parameter

Description:

Bit list with different function in the company products (ie can be turned of).

Structure of the parameter:

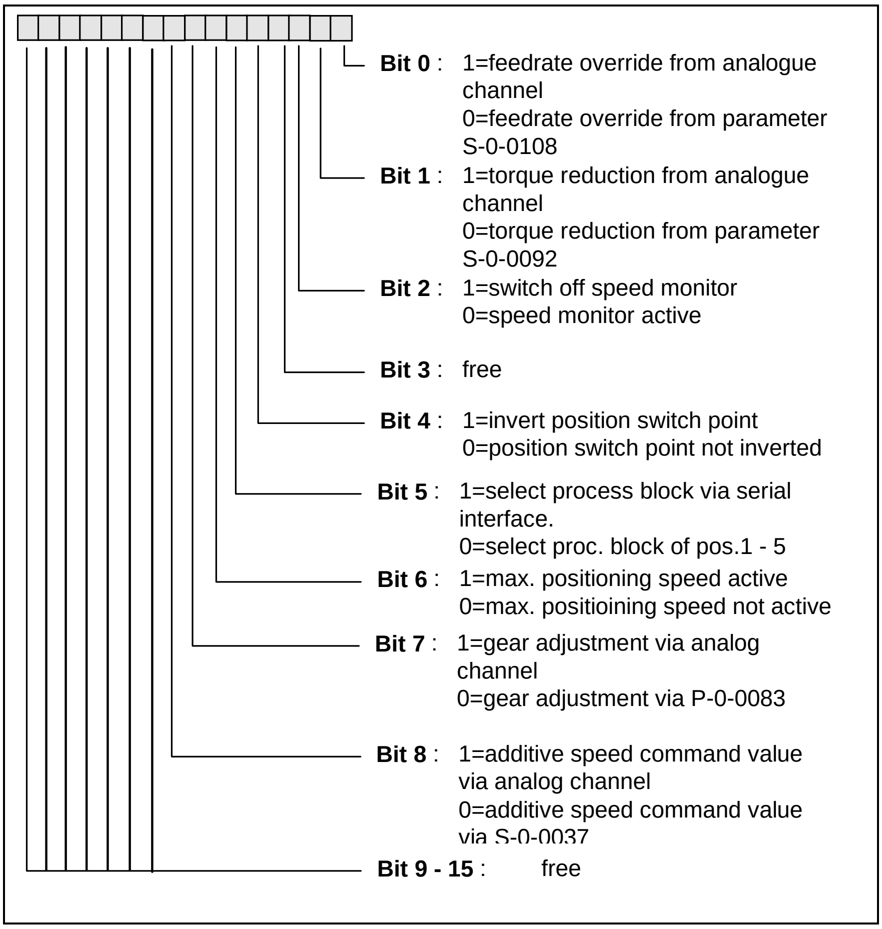


Fig. 3-12: P-0-4027, Function Parameter

P-0-4027-Attributes

ID number:	P-0-4027	**Editability:**	P2
Function:	rameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	0 x 0008

P-0-4028, Impulse Wire Feedback Offset

Description:

With this parameter, the offset of the impulse feedback for resolver control will be stored.

It will be available during construction and stored in the feedback memory.

P-0-4028-Attributes

ID number:	P-0-4028	**Editability:**	no
Function:	Parameter	**Memory:**	Feedb.-E²prom
Data length:	4 Byte	**Validity check:**	no
Format:	DEC	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	100,0000

P-0-4029, Impulse Wire Feedback PIC Counter Value

Description:

This parameter contains information on the absolute position of the control.

The value will be actualized with each initializing position. The user cannot edit it.

P-0-4029-Attributes

ID number:	P-0-4029	**Editability:**	no
Function:	Parameter	**Memory:**	Feedb.-E²prom
Data length:	4 Byte	**Validity check:**	no
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	100,0000

P-0-4030, Jog Velocity

Description:

Limit value for the movement velocity during movement via the jog input. The value must be smaller than that in parameter S-0-0091 „bipolar limit velocity value."

The movement velocity will also be controlled by **"S-0-0108, feed rate override"** and the **maximum positioning speed (S-0-0259)**

P-0-4030-Attributes

ID number:	P-0-4030	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	4 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	S-0-0044	**Combination check:**	no
Posit. after the dec.:	S-0-0044	**Cyc. transmittable:**	no
Input value min / max:	S-0-0044	**Default value:**	100,0000

P-0-4031, Absolute Encoder Emulator Offset

Description:

The parameter supports the initializing position of the absolute encoder emulation (SSI-output). The parameter will be edited by the „absolute measurement emulator setting" from the company product.

P-0-4031-Attributes

ID number:	P-0-4031	**Editability:**	no
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	4 Byte	**Validity check:**	only with SSI Emulation
Format:	HEX	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-4032, C3 Command Set Emulation Absolute Value

Description:

With this command, the position which is set in parameter P-0-0515 will be set in the absolute encoder interface. The command can only be processed if the control opening is turned off.

See also Function Description: "Executing Parameter Commands"

P-0-4032-Attributes

ID number:	P-0-4032	**Editability:**	P4
Function:	Command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	binary	**Extreme value check:**	no
Unit English:	--	**Combination check:**	yes
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	0/11	**Default value:**	--

P-0-4033, Steps per Revolution

Description:

The number of revolutions required for the mechanical motor rotary movement with the motor interface.

P-0-4033-Attributes

ID number:	P-0-4033	**Editability:**	P23
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	4 Byte	**Validity check:**	yes
Format:	binary	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	16/65536	**Default value:**	1250

P-0-4034, Stepper Motor Interface Mode

Description:

Setup of the mode of the stepper motor control signals.

Stepper motor signals	Setting
Quadrature signals	1
Forward/backward signals	2
Step and direction signals	3

Fig. 3-13:Stepper motor modes

P-0-4034-Attributes

ID number:	P-0-4034	**Editability:**	P2
Function:	Parameter	**Memory:**	parallel EEProm
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	1/3	**Default value:**	1

P-0-4035, Unbalanced Current

Description:

In this parameter, the current value is stored with which the scaling of the **current measurement** of the drive control is precisely compared. This is used to eliminate system errors in current measurement. The value has no meaning to the user and **cannot be changed.**

P-0-4035-Attributes

ID number:	P-0-4035	**Editability:**	no
Function:	Parameter	**Memory:**	Verst.-EEPROM
Data length:	4 Byte	**Validity check:**	Phase 3
Format:	DEC_OV	**Extreme value check:**	yes
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0/500	**Default value:**	--

P-0-4036, Contacted Motor Type

Description:

In this parameter, the drive controller identifies its type in text format.

If this locked type deviates from that read out of **S-0-0141, motor type,** during heavy switching in drive mode, then a new motor is contacted. The the server should display „**UL** (basic load) to indicate that motor dependent parameters have been initialized; see command **S-0-0262, basic load**. In this parameter, the „Contacted Motorype" can be overwritten with the basic load.

P-0-4036-Attributes

ID number:	P-0-4036	**Editability:**	P234
Function:	Parameter		
Memory:	Parameter-EEPROM		
Data length:	up to 40 symbols	**Validity check:**	Phase 3
Format:	ASCII	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	empty

P-0-4037, Default Velocity Loop Proportional Gain

Description:

The default value for the velocity encoder proportional amplifier. The parameter is set on site at the manufacturer's and cannot be changed. With „default parameter load", the value of the parameter will be copied into parameter **S-0-0100, velocity loop proportional gain** which has a different unit.

With the default values, a drive of the motor is possible; for optimal adaptation on the machine connection, the parameter S-0-0100 must sill be optimized.

P-0-4037-Attributes

ID number:	P-0-4037	**Editability:**	no
Function:	Parameter	**Memory:**	Feedback
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	As/rad	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0/32767	**Default value:**	--

P-0-4038, Default Velocity Loop Integral Action Time

Description:

The default value for the velocity loop integral action time. The parameter will be determined during the manufacturing stage and cannot be changed. With the „default parameter load", the value of the parameter will be copied into the parameter **S-0-0101, velocity loop integral action time**.

With the default values, a drive of the motor is possible; for optimal adaptation on the machine connection, the parameter **S-0-0101** must sill be optimized.

P-0-4038-Attributes

ID number:	P-0-4038	**Editability:**	no
Function:	Parameter	**Memory:**	Feedback
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	ms	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0,1/6553,5	**Default value:**	--

P-0-4039, Default Current Loop Proportional Gain

Description:

The default value for the current loop proportional gain. The parameter will be determined on site at the manufacturer's and cannot be changed. With the „default parameter load", the value of the parameter will be copied into the parameter **S-0-0106, proportional gain 1 current regulator**.

The current loop gain is already optimized and may not be changed.

P-0-4039-Attributes

ID number:	P-0-4039	**Editability:**	no
Function:	Parameter	**Memory:**	Feedback
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	V/A	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0/500	**Default value:**	--

P-0-4040, Digital Inputs

Description:

Bit list to be read by the digital input signals of the DKC.

1 means: there is a voltage of about 24V at the input.

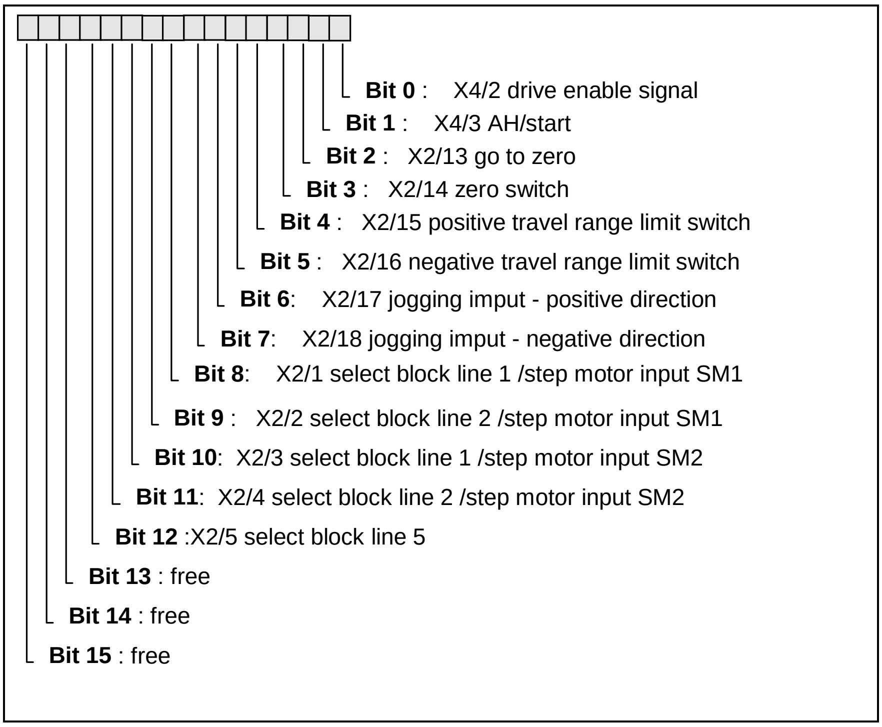


Fig. 3-14: P-0-4040 digital inputs

P-0-4040-Attributes

ID number:	P-0-4040	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	Byte	**Validity check:**	no
Format:	binary	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-4041, Digital Outputs

Description:

Bit list to be read by the digital output signals of the DKC.

1 means: there are 24V at the output.

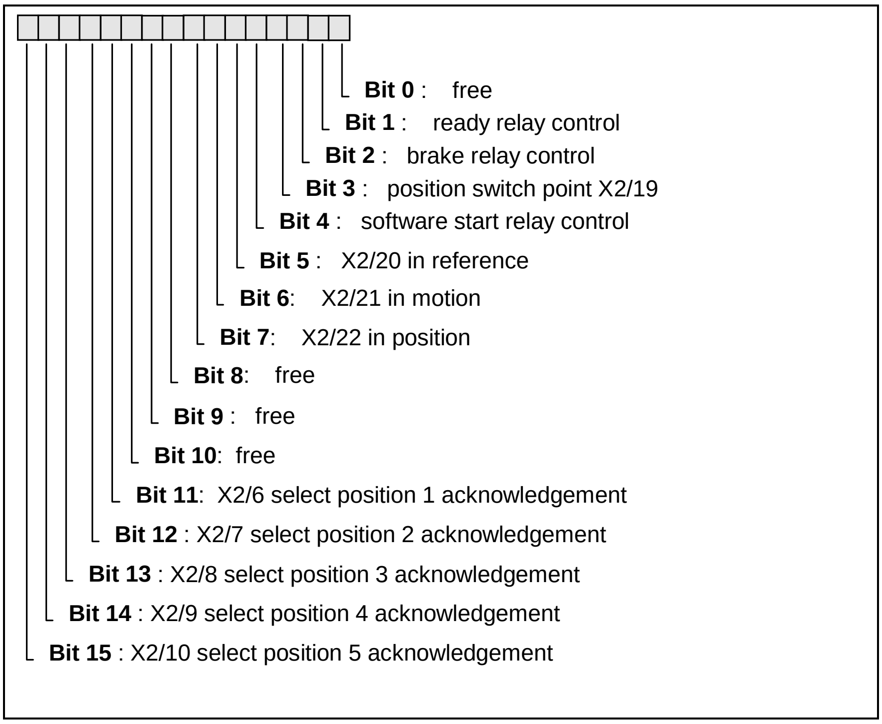


Fig. 3-15: P-0-4041 digital outputs

P-0-4041-Attributes

ID number:	P-0-4041	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	binary	**Extreme value check:**	no
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-4042, Default Velocity Loop Delay Time

Description:

The defaul value for the velocity loop delay time. The parameter will be determined during the manufacturing stage and cannot be changed. With the „default parameter load", the value of the parameter will be copied into the parameter **P-0-0004, velocity encoder smoothing time constant**.

P-0-4042-Attributes

ID number:	P-0-4042	**Editability:**	no
Function:	Parameter	**Memory:**	Feedback
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	µs	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	500/65535	**Default value:**	--

P-0-4043, Bleed Overload Factor

Description:

The parameter describes the short duration overload capacity of the installed damping resistance. If the bleed overload factor = 60, then the peak capacity of the damping resistance is 60 times larger than temporal capacity. This parameter is set on site at the manufacturer's and cannot be changed.

P-0-4043-Attributes

ID number:	P-0-4043	**Editability:**	no
Function:	Parameter		
Memory:	Amplifier EEProm		
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/100	**Default value:**	--

P-0-4044, Bleeder load

Description:

With this parameter, the average capacity is read from which the damping resistance can be changed.

That means that the damping resistance with its temporal capacity will be acted upon 100 %. For a safe drive, the load should be less than 80%. The value is very stable.

In order to tell if a processing cycle of the damping resistance is not overloaded, the analog signal „bleeder load" must be considered.

P-0-4044 Attributes

ID number:	P-0-4044	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	decimal	**Extreme value check:**	no
Unit English:	%	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/65536	**Default value:**	--

P-0-4045, Active Continuous Current

Description:

This parameter shows how much current the drive can supply in the actual Combination in continual operation.Multiplied with the **P-0-0051, torque constant** of the motor yields the continual operational torque.

This parameter will calculate during heavy switching in the drive mode from the drive control and is not changeable.With the activation of this limit, the following **current and torque limitations and settings** shrink.

ID Number	Name	Unit
S-0-0111	Still stand active current motor 1)	A
S-0-0112	Amplifier active current 1	A
P-0-0518	Amplifier nominal current 2	A
S-0-0092	Torque limit bipolar 2)	%
P-0-0006	Overload factor 3)	%

Fig. 3-16: Active durration current, Dependence

1) The standstill active current of the motor is that value of which the procentage specifications pocess: it corresponds to 100%.

2) Shrinks if less than 100%

3) The dependence on the overload factor is not linear. It is observeable in connection with the active current 1 and the nominal current 2.

P-0-4045-Attributes

ID number:	P-0-4045	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-4046, Active Peak Current

Description:

This parameter show how much current the drive can supply in the actual Combination **momentarily** (0,4s) of operation.Multiplied with the **P-0-0051, torque constant** of the motor yields the momentary operation torque(ie for acceleration operations).

This parameter will calculate during heavy switching in the drive mode from the drive control and is not changeable. With the activation of this limit, the following **current and torque limitations and settings** shrink.

ID Number	Name	Unit
S-0-0109	Motor peak current	A
S-0-0110	Amplifier peak current 1	A
P-0-0519	Amplifier peak current 2	A
S-0-0092	Torque limit bipolar	%
P-0-0006	Overload factor 3)	%

Fig. 3-17: Active peak current, dependence

The dependence on the overload factor is not linear. It can be seen in connection with peak current 1 and peak current 2.

P-0-4046-Attributes

ID number:	P-0-4046	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	4 Byte	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit English:	A	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	--	**Default value:**	--

P-0-4047, Motor Inductance

Description:

Measured inductance of the motor between two clamped connections.

The parameter will be determined during the manufacturing stage and cannot be changed.

P-0-4047-Attributes

ID number:	P-0-4047	**Editability:**	no
Function:	Parameter	**Memory:**	Feedback
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	no
Unit English:	mH	**Combination check:**	no
Posit. after the dec.:	2	**Cyc. transmittable:**	no
Input value min / max:	0/65535	**Default value:**	--

P-0-4048, Stator Resistance

Description:

Measured stator resistance of the motor between two connection clamps.

The parameter will be determined during the manufacturing stage and cannot be changed.

P-0-4048-Attributes

ID number:	P-0-4048	**Editability:**	no
Function:	Parameter	**Memory:**	Feedback
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	no
Unit English:	Ohm	**Combination check:**	no
Posit. after the dec.:	3	**Cyc. transmittable:**	no
Input value min / max:	0/65,535	**Default value:**	--

P-0-4049, Default Current Loop Integral Action Time

Description:

The default value for the current loop integral action time. The parameter will be determined during the manufacturing stage and cannot be changed. With the „default parameter load", the value of the parameter will be copied into the parameter **S-0-0107, current regulator 1 integral action timeve**.

The current loop integral action time is already optimized and may not be changed.

P-0-4049-Attributes

ID number:	P-0-4049	**Editability:**	no
Function:	Parameter	**Memory:**	Feedback
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	ms	**Combination check:**	no
Posit. after the dec.:	1	**Cyc. transmittable:**	no
Input value min / max:	0/6553,5	**Default value:**	--

P-0-4050, Delay Answer RS232/485

Description:

Defining the minimal time that must pass after the last symbol of a telegram would be received over the serial interface and before the first symbol of the reaction may be sent.This time span will be required with the drive of an RS485 for the switch from send to recieve drive (ie required switch).For the drive of a RS232, this parameter is not necessary.

See also Function Description: "Communication Parameters"

The required response delay time is dependent on the PC used and must, therefore, be set to satisfy the PC.

P-0-4050-Attributes

ID number:	P-0-4050	**Editability:**	P2/P3/P4
Function:	Parameter	**Memory:**	yes
Data length:	2 Byte	**Validity check:**	yes
Format:	decimal	**Extreme value check:**	yes
Unit English:	ms	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input value min / max:	0/200	**Default value:**	0

P-0-4051 Process block Acquittance

Description:

This parameter reflects the positioning command selection acquittance. It is also accessible in the profibus outputs provided for this purpose.

At **Drive_Start = 0** (Drive Halt) the acquittance displays the preselected positioning command, **inverted** (complement), if controller enable = 1.

At **Drive_Start = 1** acquittance displays the current positioning command, and is **not inverted**, if it was accepted.

See also Functional Description "Acknowledging position block select with drive enable active"

P-0-4051 - Attributes

ID number:	P-0-4051	**Editability:**	no
Function:	Parameter	**Memory:**	no
Data length:	2 bytes	**Validity check:**	no
Format:	DEC_OV	**Extreme value check:**	no
Unit in Ger./Eng.:	--/--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input min/max:	--/--	**Default value:**	--

P-0-4052 Last Process block

Description:

This parameter contains the number of the last accepted positioning command. This last process command number is also available after switching off and back on as the positioning block selection acquittance, as long as controller enable has not been given.

P-0-4052 - Attributes

ID number:	P-0-4052	**Editability:**	P2
Function:	Parameter	**Memory:**	Param.EEPROM
Data length:	2 bytes	**Validity check:**	P3
Format:	DEC_OV	**Extreme value check:**	no
Unit in Ger./Eng.:	--/--	**Combination check:**	no
Posit. after the dec.:	0	**Cyc. transmittable:**	no
Input min/max:	--/--	**Default value:**	--

P-0-4094, Command Parameter Default Set

Description:

With the operation of this command, all parameters will be placed in the parallel EEProm with the EEProm stored values.Invalid parameters will be corrected.

After the trade of the company version, all parameter will be set as invalid.THe drive calls then „PL" on the seven segment display (the serial interface is still not active).By pressing the button S1, this command will also be started so that all the parameters stay on the default value.

P-0-4094-Attributes

ID number:	P-0-4094	**Editability:**	P2
Function:	Command	**Memory:**	no
Data length:	2 Byte	**Validity check:**	no
Format:	binary	**Extreme value check:**	yes
Unit English:	--	**Combination check:**	no
Posit. after the dec.:	--	**Cyc. transmittable:**	no
Input value min / max:	0/11 b	**Default value:**	--

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1 DIAGNOSTIC MESSAGE DESCRIPTION

1.1 Tips for Eliminating Malfunctions

The following diagnostic descriptions explain the meaning of the H1 condition display on the DKC. The meaning, possible causes for the error, and the means of prevention are described in this section.

If a malfunction cannot be eliminated with the help of the diagnostic descriptions, please contact **INDRAMAT** customer service.

Reset Button S1

After the error has been eliminated the error message must be cleared by pressing the clear error button S1. The drive controller has an error memory which works on the "first-in, first-out" principle. If several errors occur in a row, the first 4 will be saved. The error which occurred first is displayed on H1. Each time the S1 key is pressed, the error which is displayed will be cleared and the next error will appear in the display until all of the saved errors have been cleared.

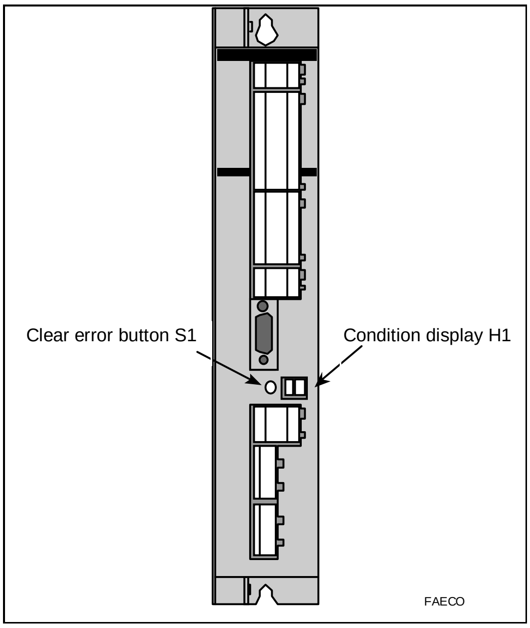

Figure 1-1: Condition diagnosis H1 and clear error button S1 on the DKC01

Condition Display H1

The H1 condition display on the front side of the DKC gives information about:

- Operating condition of the drive controller
- Drive controller or cable malfunctions
- Motor malfunctions
- Malfunctions caused by invalid parameter input
- Application errors

1.2 Error Diagnostic Message

UL Motor Type not Reported

Description:

The settings for current regulation, velocity command, and position loop are stored in the feedback of the motor. After powering up, the drive compares the motor type stored in the parameters with the connected motor type. If the two do not match, then the drive remains in this state.

By pressing the S1 key, the drive overwrites its stored parameters with the control loop parameters from the motor feedback.

Cause:

Motor was exchanged.
Parameter file was loaded, but parameter “**P-0-4036, motor type connected”** contained a different motor type.

Remedy:

Command ”C700 Basic Load” or press the S1 button.

F208 Attributes

SS Display :	UL
Diagnostic message number :	F208
Error class :	Non-fatal
Error number :	208

PL Load Parameter Default Value

Description:

After the firmware is replaced (EPROMs), if the parameters have been changed in regards to the old product, the drive displays “**PL**”. By pressing the S1 button on the drive or by starting the command “load basic parameters”, all the parameters will be erased and restored with the default values.

Cause:

Product was replaced. The number of parameters in comparison to the new products has changed.

Remedy:

Press S1 button on the drive controller and all the paramters will be erased and restored with default values

WARNING

⇒ This overwrites all parameters and positioning blocks.

F209 Attributes

SS Display : PL

Diagnostic message number : PL

Error class : Non-fatal

F207 Switching to an Uninitialized Operating Mode

Description:

A valid operating mode has not been defined.

This error cannot occur in the DKC01 because the input of the operating mode will be tested at input.

Remedy:

Input correct operating mode

F207 attributes

SS Display : F2/07

Error number : 207

Diagnostic message number : F207

Error class : Non-fatal

F218 Heatsink Overtemperature Shutdown

Description:

The temperature of the DKC heatsink will be monitored. If the temperature of the heatsink is too high, the drive will power down in order to protect against damage.

Cause:

1. Ambient temperature is too high. The specified operational data is valid up to an ambient temperature of 45°C.
2. The DKC's heatsink is dirty.
3. Air flow is prevented by other assembly parts or a control cabinet panel assembly.
4. Heatsink blower may be defective

Remedy:

For 1. Reduce the ambient temperature; for example, through cooling of the control cabinet

For 2. Remove any obstruction or dirt from the heatsink.

For 3. Install the device vertically and clear a large enough area for proper heatsink ventilation.

For 4. Exchange drive.

F218 attributes

SS Display :	F2/18
Error number :	218
Diagnostic message number :	F218
Error class :	Non-fatal

F219 Motor Overtemperature Shutdown

Description:

Motor temperature has risen to an unacceptable level. As soon as temperature threshold (155°C) is exceeded, the drive will immediately be brought to a standstill as set in the error reaction (P-0-0119, best possible standstill).

It applies:

temperature warning threshold < temperture error threshold

See also **E251 motor overtemperature warning**

Cause:

1. The motor was overloaded. The effective torque demanded from the motor was above its allowable continuous torque level for too long.
2. Break in line, ground short or short circuit in the motor temperature monitor line
3. Instability in the velocity loop.

Remedy:

For 1. Check the installation of the motor. If the system has been in operation for a long time, check to see if the the operating conditions have changed. (in regards to pollution, friction, moved components, etc.)

For 2. Check wires and cables to the motor temperature monitor for wire breaks, earth short and short circuits.

For 3. Check velocity loop parameters.

F219 Attributes

SS Display :	F2/19
Error number :	219
Diagnostic message number :	F219
Error class :	Non-fatal

F220 Bleeder Overtemperature Shutdown

Description:

The regenerated energy from the mechanism of the machine via the motor has exceeded the power capability of the bleeder resistor. By exceeding the maximum resistance energy, the drive will shutdown according to the set error reaction. Thereby protecting the bleeder from temperature damage.

Cause:

The reflected energy from the machine's mechanism over the motor is too large.

Remedy:

With too much power ---> reduce the acceleration value

With too much energy ---> reduce the velocity

Check the drive installation.

May require installation of an additional bleeder module.

F220 Attributes

SS Display :	F2/20
Diagnostic message number :	F220
Error class :	Non-fatal

F226 Undervoltage Error

Description:

The level of the DC bus voltage will be monitored by the drive controller. If the DC bus voltage falls below a minimal threshold, the drive independently shuts down according to the set error reaction.

Cause:

1. The power source has been interrupted without first switching off the drive enable (RF).
2. Disturbance in the power supply

Remedy:

For 1 Check the logic regarding the activation of the drive within the connected control.

For 2 Check the power supply.

The error can be cleared by removing the control enable signal.

F226 Attributes

SS Display :	F2/26
Error number :	226
Diagnostic message number :	F226
Error class :	Non-fatal

F228 Excessive Deviation

Description:

The drive could not process the given command value and reacted according to the set error reaction.

Cause:

1. The acceleration ability of the drive was exceeded.
2. The motor shaft was blocked.
3. Parameterization error in the drive parameters.
4. **"S-0-0159, Monitoring Window"** was parameterized incorrectly

Remedy:

For 1. Check the **Bipolar Torque Limit, S-0-0092** parameter and set it equal to the maximum allowable value for the application.

For 2. Check the mechanical system and eliminate any jamming of the motor shaft

For 3. Check the drive parameters (control loop settings)

For 4. **Parameterize "S-0-0159, Monitoring Window"**

F228 Attributes

SS Display :	F2/28
Error number :	228
Diagnostic message number :	F228
Error class :	Non-fatal

F229 Motor Encoder Error: Quadrant Error

Description:

An encoder signal error was found during the encoder evaluation.

Cause:

1. Defective encoder cable
2. Insulation disturbance on the encoder or the encoder cable
3. Defective drive controller

Remedy:

For 1. Check the encoder cable and change if necessary.

For 2. Use only insulated motor cable and power cables
Separate encoder cable from power cables

For 3. Exchange drive controller

F229 Attributes

SS Display :	F2/29
Error number :	229
Diagnostic message number :	F229
Error class :	Non-fatal

F248 Low Battery Voltage

Cause:

The connected motor has an absolute encoder. The absolute position information is stored in the motor feedback. This memory has a battery powered backup for the electronic circuit. The battery is designed for a operating life of 10 years. If the battery voltage drops below 2.8 V, this message appears. The absolute encoder function is preserved for about 2 weeks.

Instructions for Exchanging Batteries

Have the following tools and accessories ready:

- Torx screwdriver, size 10
- Needle nose pliers, torque wrench
- New packaged battery (Part No.: 257101)

If the control voltage of the installed battery is turned off, the absolute position is lost.

The absolute position must be re-established through the process of the command **Set Absolute Measurement**.

F248 Attributes

SS Display :	F2/48
Error number :	248
Diagnostic message number :	F248
Error class :	Non-fatal

F262 External Short at Status Outputs

Description:

Status outputs are monitored for short circuits and thermal overload.

- If output current exceeds 350mA for about 1µs, then this is acknowledged as a short circuit and the pertinent channel is shut off. The output remains off unti the error is cleared.
- With thermal overload, the error is set and the output(s) shut off. After the driver has cooled off, the outputs are switched back on and so on. The error, however, remains until it is cleared. Thermal overload can occur if several outputs are overloaded in excess of 80 mA.

Note: Light bulbs, for example, cannot be controlled as their inrush current causes a short-circuit.

Cause:

1. Short circuited outputs (X2/6, X2/7, X2/8, X2/9, X2/10, X2/20, X2/21, X2/22)
2. One or more outputs are overloaded.

Remedy:

For 1. Eliminate short circuit or limit switching current (< 350 mA)

For 2. Drop current, depending on output, to < 80 mA.

F262 Attributes

SS Display :	F2/62
Error number :	F262
Diagnostic message number :	262
Error class :	Non-fatal

F276 Absolute Encoder Error

Description:

When turning off the drive controller with a absolute encoder (multiturn), the actual feedback position will be stored. When powered up, the absolute position given by the encoder is compared to the stored position. If the deviation is larger than the paramaterized **"P-0-0097, AbsoluteEncoderMonitoring Window"**, the error **"F276, Absolute Encoder Error"** will appear and be given to the control system.

Cause:

1. Turning on for the first time (invalid stored position).
2. The motor was moved further than allowed by the parameter in the absolute encoder monitoring window, P-0-0097, while it was turned off.
3. Incorrect position initialization

Remedy:

For 1. Press S1 to reset the error and set the absolute position.

For 2. The motor was moved while turned off and sits outside of its permissible position. Check to see if the displayed position is correct in relation to the machine zero point. Reset subsequent errors.

For 3. **An accident may occur by accidental shaft movement.**

Check absolute position informartion. A feedback defect is present if the absolute position information is false. The motor should be exchanged and sent to the INDRAMAT Customer Service .

See also Function Description "Absolute Encoder Monitoring"

F276 Attributes

SS Display :	F2/76
Error number :	276
Diagnostic message number :	F276
Error class :	Non-fatal

F629 Positive Travel Limit Value is Exceeded

The drive has been provided with a command value that leads to an axis position outside the positive travel range. The axis has been stopped and the error reaction "set velocity command value to zero" issued. Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

S-0-0049, Positive position limit value is exceeded.

Remedial action:

1. Check **S-0-0049, Positive position limit value**
2. Check the controller software limits
3. Activate the axis after the error reaction

Procedure:

- Clear the error
- Activate power if it has been de-activated
- Move the axis to the permissible working range

Note: Only command values that lead back into the permissible working range will be accepted. Any other command value will stop the drive again.

See also Function description: "Transverse range limits"

F629 attributes

SS Display:	F6/29
Error number:	629
Diagnosis number:	F629
Error class:	Travel range

F630 Negative Travel Limit Value is Exceeded

The drive has been provided with a command value that leads to an axis position outside the negative travel range. The axis has been stopped and the error reaction "set velocity command value to zero" issued. Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

S-0-0050, Negative position limit value is exceeded.

Remedial action:

1. Check **S-0-0050, Negative position limit value**
2. Check the controller software limits
3. Activate the axis after the error reaction

Procedure:

- Clear the error
- Activate power if it has been de-activated
- Move the axis to the permissible working range

Note: Only command values that lead back into the permissible working range will be accepted. Any other command value will stop the drive again.

See also Function description: "Transverse range limits"

F630 attributes

SS Display:	F6/30
Error number:	630
Diagnosis number:	F630
Error class:	Travel range

F643 Positive Travel Limit Switch Detected

The positive travel limit switch has been actuated. The axis has been stopped with the error reaction "set velocity command value to zero". Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

The positive travel limit switch has been actuated.

Remedial action:

1. Reset the error
2. Activate the power supply
3. Move the axis into the permissible working range

Note: The drive will not accept any command values that lead further away from the permissible range. Specifying such a command will again generate this error.

See also Function description: "Transverse range limits"

F643 attributes

SS Display:	F6/43
Error number:	643
Diagnosis number:	F643
Error class:	Travel range

F644 Negative Travel Limit Switch Detected

The negative travel limit switch has been actuated. The axis has been stopped with the error reaction "set velocity command value to zero". Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is considered as an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

The negative travel limit switch has been actuated.

Remedial action:

1. Reset the error
2. Activate the power supply
3. Move the axis into the permissible working range

Note: The drive will not accept any command values that lead further away from the permissible range. Specifying such a command will again result in this error.

F644 attributes

SS Display:	F6/44
Error number:	644
Diagnosis number:	F644
Error class:	Travel range

F822 Motor Encoder Failure: Signal too Small

Description:

The motor encoder signals are monitored. If the signal amplitudes as measured via AK1 and AK2 are outside of the allowable region between Uss = 12.0V and Uss = 18.0 V, then the error message appears. The drive becomes torque-free and an optional brake is immediately activated.

Cause:

1. Defective feedback cable.
2. Defective feedback.

Remedy:

For 1. Check the feedback cable.

Lay the power cables separate from the feedback cable.

The cable shield must be connected to the drive controller.

(See also project reference of the drive control).

For 2. Exchange motor.

Note: This error can only be cleared in parametrization mode (phase 2). As a result of this error, the encoder emulation is switched off.

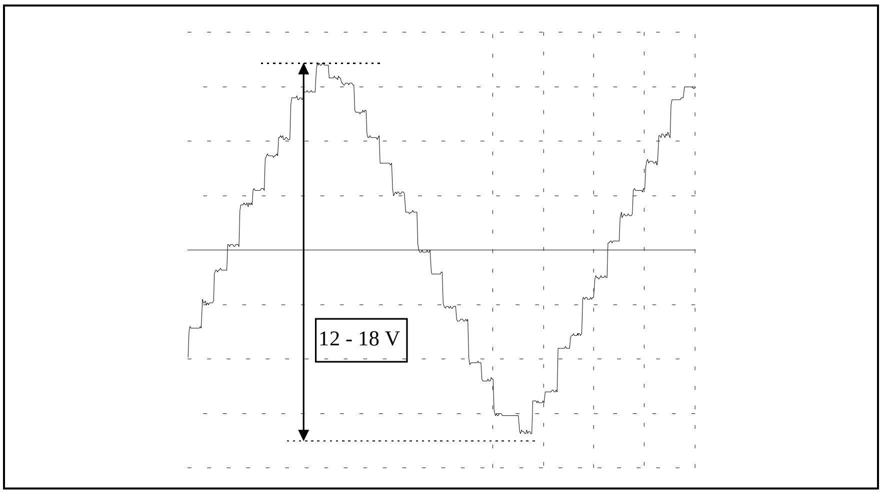

Figure 1-2: Methodically measured signal amplitude over AK: X31/1-2

F822 Attributes

SS Display:	F8/22
Error number:	822
Diagnosis number:	F822
Error class:	Fatal

F860 Overcurrent: Short in Powerstage

Description:

The current in the power transistor bridge has exceeded twice the peak current of the drive. As a result, the drive will be immediately turned off. The drive has switched to a torque-free condition. An optional brake is immediately activated.

Cause:

1. Short circuit in the motor cable.
2. Defective power section of the drive controller.
3. The current regulator was incorrectly parameterized.

Remedy:

For 1. Check the motor cable for a short.

For 2. Exchange drive controller.

For 3. The current regulator parameters should not deviate from the default values of the feedback.

F860 Attributes

SS Display :	F8/60
Error number :	860
Diagnostic message number :	F860
Error class :	Fatal

F870 +24 V Error

Description:

The DKC requires a 24V control voltage. If the maximum allowable tolerance of +- 20% is exceeded, then the drive is immediately switched to torque free operation. An optional brake is activated.

Cause:

Disturbance or overload of the 24 V supply voltage. Measure control voltages.

Remedy:

Check wiring and/or replace power supply module.

Note: This error can only be cleared in parametrization mode (phase 2). As a result of this error, the encoder emulation is switched off.

F870 Attributes

SS Display :	F8/70
Error number :	870
Diagnostic message number :	F870
Error class :	Fatal

F873 Power Supply Driver Stage Fault

Description:

The voltage supply of the driver stage is monitored and if the voltage is too low then the drive is turned off.

Cause:

Voltage supply of the driver stage is too low

Remedy:

Exchange drive controller

F873 Attributes

SS Display :	F8/73
Error number :	873
Diagnostic message number :	F873
Error class :	Fatal

F878 Velocity Loop Error

Description:

The velocity loop monitor will appear when the following conditions occur simultaneously:

- The current command value is at the peak current limit
- The difference between the actual velocity and the command velocity is larger than 10% of the maximum motor velocity.
- actual speed > 1.25% of maximum speed
- command and actual acceleration have different qualifying signs

Cause:

1. Motor cable is connected incorrectly.
2. Defective controller section of the drive.
3. Defective feedback.
4. Velocity loop paramaterized incorrectly.
5. Incorrect commutation offset

Remedy:

For 1. Check motor cable connection.

For 2. Exchange drive controller.

For 3. Exchange motor.

For 4. Check velocity controller to see if it is within operational parameters.

For 5. Exchange motor.

F870 Attributes

SS Display :	F8/70
Error number :	870
Diagnostic message number :	F870
Error class :	Fatal

F879 Velocity Limit Value Exceeded (S-0-0092)

Description:

The actual velocity is monitored in torque regulation mode. This error is generated if the programmed velocity in the **"S-0-0091, bipolar velocity limit value"** parameter is exceeded by 1.25 times or a maximum of 100 Rpm.

Cause:

The load torque was smaller or larger than the torque command value for too long a time. This leads to an increase in the actual velocity up to the maximum possible motor velocity.

Remedy:

Check the primary control loop.

F879 Attributes

SS Display :	F8/79
Diagnostic message number :	F879
Error class :	Fatal

F895 4 kHz Signal Error

Description:

The 4kHz signal is synchronized with the software processing for creation of the resolver signal. This error message is created when synchronization occurs improperly.

Cause:

1. The synchronization of the resolver controller voltage is invalid in regards to the software.
2. The error can be produced through an electrical discharge.

Remedy:

For 1. Exchange drive controller and return for testing.

For 2. Power down and then on. If this in not successful; exchange drive controller.

F895 Attributes

SS Display :	F8/95
Error number :	895
Diagnostic message number :	F895
Error class :	Fatal

1.3 Warning Diagnostic Messages

E209 Parameter storage activ

Description:

A storage procedure is running in the drive as long as this warning is displayed. This means that the drive may not yet be switched off.

Note: Wait until warning E209 fades before switching power off. If power is switched off while the warning stands, then the parameters could be lost or some parameters could become invalid.

E209 Attributes

SS Display :	E2/09
Diagnostic message number :	E209
Warning class :	Non-fatal

E248 Interpolation acceleration equals 0

Description:

Note that the currently effective acceleration in the position command value is equal to zero.

This is possible, for example, if the selected positioning block has a parametrized acceleration of a=0.

Remedy:

Enter a sensible accel value >0.

E248 Attributes

SS Display :	E2/48
Diagnostic message number :	E248
Warning class :	Non-fatal

E249 Positioning vel. (S-0-0259) greater S-0-0091

Cause:

For modes "drive-internal interpolation" and the "block-controlled mode", a speed must be entered in parameter **S-0-0259, Positioning speed** must be entered with which the target position can be reached.

If this exceeds permissible maximum value **S-0-0091, bipolar speed limit value,** then message E249 is generated.

Remedy:

S-0-0259, Positioning speed or S-0-4007, process block speed must be reduced.

E249 Attributes

SS Display :	E2/49
Diagnostic message number :	E249
Warning class :	Non-fatal

E250 Heatsink Overtemperature Warning

Description:

The temperature of the heatsink in the drive controller has reached the maximum allowable temperature. Within a time frame of 30 seconds, the drive follows the command value input. Consequently, there exists the possibility to shut down the motor with the control so that it remains true to the process. (For example close the operation, leave the collision area, etc.) After 30 seconds, the parameter "**Best Possible Deceleration, P-0-0119"** set reaction appears during operation.

Cause:

1. Deficiency of the drive's internal blower.
2. Deficiency of the control cabinet’s climate control.
3. Incorrect control cabinet dimensioning regarding the head ventilation.

Remedy:

For 1. If the blower fails exchange the drive controller.

For 2. Install climitization feature to the cabinet.

For 3. Check the dimensions of the control cabinet.

E250 Attributes

SS Display :	E2/50
Diagnostic message number :	E250
Warning class :	Non-fatal

E251 Motor Overtemperature Warning

Description:

As soon as the temperwature warning threshold (145°C) is exceeded, warnig E251 is generated and the drive complies with the command value.

This state can last infinitely without a powering down occurring. Not until the temperature error threshold is exceeded will an immediate powering down take place.

See also **F219 Motor Overtemperature Shutdown**

Cause:

The motor became overloaded. The effective torque required of the motor was above the allowable standstill continuous torque for too long.

Remedy:

Check the installation of the motor. For systems which have been in use for a long time, check to see if the drive conditions have changed (in regards to pollution, friction, components which have been moved, etc).

E251 Attributes

SS Display :	E2/51
Diagnostic message number :	E251
Warning class :	Non-fatal

E252 Bleeder Overtemperature Warning

Cause:

The dampening resistance in the DKC is balanced through the energy that is reflected from the motor (about 90%). The bleeder overtemperature warning shows that an overload of the bleeder is expected with continued increasing feedback energy.

Remedy:

Reduce acceleration value or velocity. Check the drive installation.

E252 Attributes

SS Display :	E2/52
Diagnostic message number :	E252
Warning class :	Non-fatal

E253 Target Position Out of Range

Description:

If a position is entered which would exceed the target position, it will not be accepted. With “command controlled operation", the drive will not move.

Cause:

1. Position limit value monitor was activated
2. In the "Drive Internal Interpolation" operating mode, the **S-0-0258, Target Position** will be checked to determine if it’s in the possible travel range of the drive.
3. In the "Command Controlled Operation" operating mode, the target position of the selected process block will be checked to see if it lies within the travel range.

The possible travel range is defined through the two parameters **S-0-0049 Position Limit Positive** and **S-0-0050, Position Limit Nega-tive.**

Remedy:

For 1. Deactivate the position limit monitor

For 2. Check the entered **S-0-0258, target position** and correct if necessary.

For 3. Check the target position of the process block. Add the relative path of travel to the actual position.

Additionally, check the position limit value.

E253 Attributes

SS Display :	E2/53
Diagnostic message number :	E253
Warning class :	Non-fatal

E254 Not Homed

Description:

If "Absolute Positioning Commands" are selected while in "Command Controlled Operation" the control drive must be homed. If this is not the case, an absolute position cannot be reached. The drive rejects this positioning command and stops. The warning E254 will be given.

Cause:

Absolute positioning command was selected without the drive being referenced.

Remedy:

1. Reference the drive
2. Select "Relative Positioning Command"

See also Function description "Drive controlled Homing Procedure"

E254 Attributes

SS Display :	E2/54
Diagnostic message number :	E254
Warning class :	Non-fatal

E255 Feedrate-Override(S-0-0108) = 0

Description:

The transversing velocity can be changed while jogging, homing and while in positioning operation with the **"S-0-0108, Feedrate Override"** parameter. Since the drive controller cannot follow command values which do not move, the warning will be given if the value of this parameter is 0.

Cause:

1. Feedrate override is set at zero.
2. The "Feedrate Override Via Analog Output" field is activated and the voltage there is 0V.
3. Positioning speed = 0

Remedy:

For 1. Set the **S-0-0108** parameter to the correct value for the application.

For 2. Deactivate the field or establish a voltage larger than 0V.

For 3. Positioning speed greater than 0 must be selected.

E255 Attributes

SS Display :	E2/55
Diagnostic message number :	E255
Warning class :	Non-fatal

E256 Torque Limit = 0

Cause:

1. For protection against mechanical overload, the maximum torque can be limited by the **"S-0-0092, Bipolar Torque Limit"** parameter. If the actual value of this parameter is equal to 0, the motor does not develop torque and does not follow the command value which has been entered.
2. Torque reduction is set through an analog channel and the established current amounts to 10 V.

Remedy:

For 1. Set the torque limit to a value larger than 0.

For 2. Establish the analog voltage so that it is smaller than 10 V.

E256 Attributes

SS Display :	E2/56
Diagnostic message number :	E256
Warning class :	Non-fatal

E257 Continuous Current Limiting Active

Description:

The drive controller sets the peak current available for 400ms. Thereafter, the continuous current limit becomes active and dynamically limits the peak current to the continuous current.

Cause:

More continuous torque was required than was available.

Remedy:

1. Check the drive installation.
2. Check the installation of the motor. For systems which have been in use for a long time, check to see if the drive conditions have changed (in regards to pollution, friction, components which have been moved, etc).

E257 Attributes

SS Display :	E2/57
Diagnostic message number :	E257
Warning class :	Non-fatal

E258 Selected Process Block is not Programmed

Cause:

A positioning block was selected for which there is no set target position or positioning velocity, etc.

Remedy:

Select another positioning block or enter the required data.

E258 Attributes

SS Display :	E2/58
Diagnostic message number :	E258
Warning class :	Non-fatal

E259 Command Velocity Limit Active

Description:

The velocity command value is limited to the value set in the **S-0-0091, Bipolar Velocity Limit** parameter when in the position and velocity control operating modes. This warning is given if the value in the **S-0-0036, Velocity Command Value** parameter reaches this limit.

Cause:

S-0-0091, Bipolar Velocity Limit parameter was set too low.

Remedy:

In normal operation, set the **S-0-0091, Bipolar Velocity Limit** parameter to a value 10% higher than the NC operation velocity.

E259 Attributes

SS Display :	E2/59
Diagnostic message number :	E259
Warning class :	Non-fatal

E260 Current limitation active!

Description:

The warning shows that the speed controller is entering its limit. This means that the acceleration capacity of the drive has been exceeded. In position control mode this means that there is an ever-increasing deviation between command and actual values (lag error).

Remedy:

- In position control, reduce parametrized accel value or speed value so that the drive can follow the position command value.
- Increase torque limit value, if necessary.

E260 Attributes

SS Display :	E2/60
Diagnostic message number :	E260
Warning class :	Non-fatal

E264 Target Position Out of Range

Cause:

When using the operating mode "command controlled operation, the target position of the selected additive process block will be verified to see if it lies within the represented range.

Remedy:

1. Check the target position and correct if necessary.
2. Select the position data display channel in modulo format.

E264 Attributes

SS Display :	E2/64
Diagnostic message number :	E264
Warning class :	Non-fatal

E825 Overvoltage Error

Cause:

1. The mechanical system energy reflected via the motor was so large for a moment that it could not be completely converted to heat by the bleeder. As a result, the DC Bus voltage rose above the maximum allowable value. The motor is then switched to torque free operation. If the DC Bus voltage falls below the maximum allowable value, the controller will be turned on again.
2. DC Bus voltage is too high

Remedy:

For 1. Reduce the acceleration value and check the drive controller layout if necessary.
Install an auxiliary bleeder, if necessary.

For 2. Check the supply voltage, if necessary.

WARNING

⇒ Danger of high-voltage shock!

E825 Attributes

SS Display :	E8/25
Error number :	825
Diagnostic message number :	E825
Error class :	Non-fatal

E829 Positive Position Limit Value Exceeded

The drive has received a command value that has led to an axis position outside the positive travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

S-0-0049, Positive position limit value exceeded.

Remedial action:

Specify command values that lead back to the valid range.

See also Function description: "Transverse range limits"

E829 Attributes

SS Display :	E8/29
Diagnostic message number :	E829
Error class :	fatal

E830 Negative Position Limit Value Exceeded

The drive has received a command value that has led to an axis position outside the negative travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

S-0-0050, Negative position limit value exceeded.

Remedial action:

Specify command values that lead back to the valid range.

See also Function description: "Transverse range limits"

E830 Attributes

SS Display :	E8/30
Diagnostic message number :	E830
Error class :	fatal

E831 Jog Position Limit Value Exceeded

Description:

If the position limit value monitor is activated and the drive is “IN REFERENCE", then it will be positioned during movement in the jogging operation on the position limit value. If the drive is positioned on the position limit value or on the other side of the position limit value, then the drive stays still and signals „"position limit value reached during jogging."

Remedy:

1. Move the motor back within the allowable travel area with the jog function.
2. Turn off the position limit value monitor.

E831 Attributes

SS Display :	E8/31
Diagnostic message number :	831
Warning class :	Fatal

E843 Positive Travel Zone Limit Switch Activated

The drive has received a command value that has led to an axis position outside the positive travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

The positive travel zone limit switch has been actuated.

Remedial action:

Specify command values that lead back to the valid range.

See also Function description: "Transverse range limits"

E843 Attributes

SS Display :	E8/43
Diagnostic message number :	E843
Error class :	fatal

E844 Negative Travel Zone Limit Switch Activated

The drive has received a command value that has led to an axis position outside the negative travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

The negative travel zone limit switch has been actuated.

Remedial action:

Specify command values that lead back to the valid range.

See also Function description: "Transverse range limits"

E844 Attributes

SS Display :	E8/44
Diagnostic message number :	E844
Error class :	fatal

1.4 Command Diagnostic Message C...

C100 Communication Phase 3 Transition Check

Description:

The command **"S-0-0127, C1 Communication Phase 3 Transition Check"** is activated. The drive switches from parameter mode into operating mode.

C100 Attributes

SS Display :	C1
Diagnostic message number :	C100

C101 Invalid Communication Parameters (S-0-0021)

Cause:

Invalid parameters were found during the switch from parameter mode to operating mode.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C101 Attributes

SS Display :	C1/01
Diagnostic message number :	C101

C102 Limit Error Communication Parameter (S-0-0021)

Cause:

Parameters which exceed their limits were found during the switch from the parameter mode to operating mode.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C102 Attributes

SS Display :	C1/02
Diagnostic message number :	C102

C200 Communication Phase 4 Transition Check

Description:

The command C2 performs the last steps of the switch from parameter mode to operational mode. Thereby, numerous parameter checks will be conducted.

C200 Attributes

SS Display : C2

Diagnostic message number : C200

C201 Invalid Parameter Block (-> S-0-0022)

Cause:

Parameters which are necessary for the operation of the drive in operating mode are invalid.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C201 Attributes

SS Display : C2/01

Diagnostic message number : C201

C202 Limit Error Parameter (-> S-0-0022)

Cause:

Parameters which are necessary for the operation of the drive in operating mode are outside of its minimum or maximum input values.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C202 Attributes

SS Display : C2/02

Diagnostic message number : C202

C203 Parameter Calculation Error (-> S-0-0022)

Cause:

Parameters which are required for operation of the drive in the operation mode, found errors in the conversion that do not permit an orderly operation.

Remedy:

Connect the control drive to a PC and activate DriveTop. Select the "Parameter List of Invalid Parameters" menu and set valid parameters.

C203 Attributes

SS Display :	C2/03
Diagnostic message number :	C203

C207 Load Error LCA

Cause:

Defective drive.

Remedy:

Power down and then on again. If this in not successfull, exchange drive.

C207 Attributes

SS Display :	C2/07
Diagnostic message number :	C207

C208 Invalid SSI Parameter (-> S-0-0022)

Description:

When the motors are first distributed, the parameter for absolute control emulation is purposely invalid to ensure that the "Set Absolute Measurement Emulator Command" will be executed after a motor is exchanged.

Cause:

The SSI emulation was selected. The parameters required for emulation are invalid.

Remedy:

Connect the control drive to a PC and activate DriveTop.

"Actual Position Output" menu with controller emulation type "Absolute Controller Emulation (SSI)":

- Describe "Homing Position/Offset"
- Select "Absolute Control Directional Counter"

C208 Attributes

SS Display :	C2/08
Diagnostic message number :	C208

C211 Invalid Feedback Data (-> S-0-0022)

Description:

Invalid data was found while processing the parameters stored in the motor feedback.

Causes:

1. Motor feedback cable not connected or it is defective
2. Defective motor feedback
3. Drive controller defective

Remedy:

For 1. Check motor feedback cable, connect at both ends

For 2. Exchange the motor

For 3. Exchange drive controller

C211 Attributes

SS Display :	C2/11
Diagnostic message number :	C211

C212 Invalid Amplifier Data (-> S-0-0022)

Description:

During the installation of the drive, data from the drive controller will be processed for drive identification. If invalid data is detected, this error message will be displayed.

Cause:

Defective hardware in the drive controller

Remedy:

Exchange drive controller.

C212 Attributes

SS Display :	C2/12
Diagnostic message number :	C212

C213 Position Data Scaling Error

Cause:

The display format of the position data can be set with the help of the scaling parameter. The internal drive format of the position data is dependent on the applied feedback and the controller resolution. The factor for the conversion of the position data from the internal drive format into the display format or the reverse conversion is outside of the workable area because either:

- Rotary motor and linear positional scaling are not representable or
- the average factor for conversion of the position data from the display format into the internal format (or reverse process) is not representable.

Remedy:

Connect the drive with a PC and start DriveTop. In the dialog box „Scaling/Mechanical system" select a scaling setting.

Should another scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0076, Position Data Scaling Type**
- **S-0-0077, Linear Position Data Scaling Factor**
- **S-0-0078, Linear Position Data Scaling Exponent**
- **S-0-0121, Input Revolutions of Load Gear**
- **S-0-0122, Output Revolutions of Load Gear**
- **S-0-0123, Feed Constant**

C213 Attributes

SS Display :	C2/13
Diagnostic message number :	C213

C214 Velocity Data Scaling Error

Cause:

The display format of the velocity data can be set with the help of the scaling parameter. The internal drive format of the velocity data is dependent on the applied feedback and the controller resolution. The factor for the conversion of the velocity data from the internal drive format into the display format (or the reverse process) is outside of the workable area.

Remedy:

Connect the drive with a PC and start DriveTop. In the dialog box „Scaling/Mechanical system" select a scaling setting.

Should another scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0044, Velocity Data Scaling Type**
- **S-0-0045, Velocity Data Scaling Factor**
- **S-0-0046, Velocity Data Scaling Exponent**
- **S-0-0121, Input Revolutions of Load Gear**
- **S-0-0122, Output Revolutions of Load Gear**
- **S-0-0123, Feed Constant**

C214 Attributes

SS Display :	C2/14
Diagnostic message number :	C214

C215 Acceleration Data Scaling Error

Cause:

The display format of the acceleration data can be set with the help of the scaling parameter. The internal drive format of the acceleration data is dependent on the applied feedback and the controller resolution. The factor for the conversion of the acceleration data from the internal drive format into the display format (or the reverse process) is outside of the workable area.

Remedy:

Connect the drive with a PC and start DriveTop. In the dialog box „Scaling/Mechanical system" select a scaling setting.

Should another scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0160, Acceleration Data Scaling Type**
- **S-0-0161, Acceleration Data Scaling Factor**
- **S-0-0162, Acceleration Data Scaling Exponent**
- **S-0-0121, Input Revolutions of Load Gear**
- **S-0-0122, Output Revolutions of Load Gear**
- **S-0-0123, Feed Constant**

C215 Attributes

SS Display :	C2/15
Diagnostic message number :	C215

C216 Torque/Force Data Scaling Error

Cause:

The display format of the torque data can be set with the help of the scaling parameter. The factor for the conversion of the torque data from the internal drive format into the display format (or the reverse process) is outside of the workable area.

Remedy:

Connect the drive with a PC and start DriveTop. Select a scaling setting in the "Scaling/Mechanical system" dialog box.

Should a scaling installation other than one from DriveTop be used, then the following parameters must be checked.

- **S-0-0086, Torque/Force Data Scaling Type**
- **S-0-0093, Torque/Force Data Scaling Factor**
- **S-0-0094, Torque/Force Data Scaling Exponent**

C216 Attributes

SS Display :	C2/16
Diagnostic message number :	C216

C217 Motor Feedback Data Reading Error

Cause:

All MKD and MDD motors contain feedback data memory. From this, the settings for the controller will be read. By processing these values, an error is detected.

Remedy:

Check the feedback cable

Exchange the motor

C217 Attributes

SS Display : C2/17

Diagnostic message number : C217

C220 Motor Feedback Initializing Error

Description:

A number of tests are performed when the motor feedback is initialized. An error was detected while doing this. This error can be:

1. Disturbance in the communication with the controller
2. Invalid offset between the high and low dissipating path
3. Error in the micro-controller of the measuring system

Cause:

1. Defective motor feedback cable
2. Defective motor feedback
3. Defective measurement system interface

Remedy:

For 1. Check the motor feedback cable

For 2. Exchange the motor

For 3. Exchange the measuring system interface (module)

C220 Attributes

SS Display : C2/20

Diagnostic message number : C220

C227 Modulo Range Error

Cause:

The given modulo value is larger than half of the represented positioning area of the drive. (Half of the represented positioning area for the DKC is 2048 rotations.)

Remedy:

Select a smaller modulo value.

See also functional description: "Boundary Conditions for Modulo Processing"

C227 Attributes

SS Display :	C2/27
Diagnostic message number :	C227

C300 Command: Set Emulation - Absolute Value

Description:

The actual position of the motor can be given by means of an SSI emulation. The zero point of a given position can be fixed with the "C3 Command set emulation-absolute value" command.

C300 Attributes

SS Display :	C3
Diagnostic message number :	C300

C300 Set Absolute Measuring

Description:

The command **"P-0-0012, Set Absolute Measurement** was activated via the control system.

C300 Attributes

SS Display :	C3
Diagnostic message number :	C300

C301 Setting Absolute Measuring not Allowed, Drive Enabled

Cause:

The command "C300 Command Setting of Absolute Measurement Emulator" was started with the given drive enable.

Remedy:

End the command and deactivate the control enable.

C301 Attributes

SS Display :	C3/01
Diagnostic message number :	C301

C302 Absolute Measuring System not Installed

Description:

The command "**P-0-0012, command set absolute measurement"** would be started without an existing absolute measurement system.

The command can not be processed because there is no existing absolute measurement system.

Cause:

1. The command was falsely activated.
2. The connected motor does not contain an absolute encoder. (Option)

Remedy:

For 1. Stop the command process.

For 2. Equip the motor or external measurement system with an absolute encoder function.

C302 Attributes

SS Display :	C3/02
Diagnostic message number :	C302

C400 Command: Switch To Parameter Mode

Description:

The command for transition is in parameter mode. While editing the parameters that can be edited only in parameter mode, this command must be processed.

C400 Attributes

SS Display :	C4
Diagnostic message number :	C400

C401 Drive Active, Switch Not Allowed

Cause:

The command C400 “switch from operational to parameter mode" would be started without the control enable being activated.

Remedy:

End the command and turn off the drive enable, then the command can be started from the beginning.

C401 Attributes

SS Display :	C4/01
Diagnostic message number :	C401

C500 Reset Class 1 Diagnostic

Description:

The command for erasing errors, **"S-0-0099, Reset Class 1 Diagnostics"** was activated via the connected control system. All internal drive errors are erased. However, the errors must have been previously corrected.

C500 Attributes

SS Display : C5

Diagnostic message number : C500

C600 Drive Controlled Homing Procedure Command

Description:

The command **"S-0-0148, Drive Controlled Homing Procedure"** was activated via the connected control system. The control drive automatically performs the internal drive homing procedure. Give the drive a start command to do this. Prior to this the drive must be enabled and in motion.

C600 Attributes

SS Display : C6

Diagnostic message number : C600

C601 Homing Not Possible If Drive Is Not Enable

Cause:

The command would be started without drive enable being turned on.

Remedy:

1. Enable Drive
2. Restart the command.

C601 Attributes

SS Display : C6/01

Diagnostic message number : C601

C602 Distance Homing Switch Reference Mark Erroneous

Cause:

During the drive controlled homing procedure, an ambiguous position for the home reference of the feedback and the switch flank of the home switch was determined.

Remedy:

The cam of the home switch must be shifted in such a manner such that an accurate homing procedure is possible.

- Read the contents of parameter **S-0-0298, reference cam shifting**
- Mechanically shift the homing cam by the amount in the parameter.
- Re-perform the drive controlled homing procedure.

C602 Attributes

SS Display :	C6/02
Diagnostic message number :	C602

C603 Homing Not Permitted in this Operating Mode

Cause:

During operation of the drive in torque control or velocity control, the homing command can not be processed.

Remedy:

Clear the homing command.

Set another operating mode.

C603 Attributes

SS Display :	C6/03
Diagnostic message number :	C603

C604 Homing of Absolute Encoder Not Possible

Cause:

If the homing command is called up by the absolute value encoder without previously processing the command **P-0-0012, setting the absolute measurement,** the reference command will be discontinued with this error.

If the encoder was able to be homed through the **"set absolute measurement"**, a position on the home value will be erased with the homing command.

Remedy:

Home the absolute encoder with the command **"Set Absolute Measurement"**

C604 Attributes

SS Display :	C6/04
Diagnostic message number :	C604

C605, Homing velocity too great

Cause:

Unequivocal allocation of a reference marker to a zero switch is not possible at a high velocity since the zero switch is only evaluated every 2 ms.

Remedial action:

Reduce the value of **S-0-0041, Homing velocity**.

C605 Attributes

SS Display:	C6/05
Diagnosis number:	C605

C700 Basic Load

Description:

When using MDD and MKD motors, the technical control adaptation of the mechanical system on the digital drive relates to the activation of the stored velocity control parameter in the motor feedback. The drive controller signals with the message C7 that the command C7 basic load was activated with the command **"S-0-0262, command basic load."**

C700 Attributes

SS Display :	C7
Diagnostic message number :	C700

C800 Load Basic Parameters

Description:

By pressing the S1 button on the controller with display PL or by starting the **P-0-4094, Command Parameter Default Set**, all parameters will be erased and set with the default value.

The process blocks are lost also.

C800 Attributes

SS Display :	C8
Diagnostic message number :	C800

D900 D9 Command Automatic Loop Control

Description:

The start of this command means that an automatic control loop setting is executed in the drive if the drive is in the loop at command start, i.e., the drive enable signal is applied.

See also Function description "Automatic control loop setting".

WARNING

⇒ The start of this command can trigger a movement if drive enable and drive start are at the drive.

⇒ The drive conducts autonomous movements within the range defined by both limits.

⇒ The E-stop sequence function and the travel range limit switch must be guaranteed and checked.

See also Function description:
"Safety Instructions"

⇒ During command D9, the drive autonomously conducts motions, i.e., without external command value.

Note: Under some circumstances, errors can also occur while the command is being executed. These are then signalled with pertinent messages.
D901 start only with RF
D902 motor feedback not valid
D903 inertia detection failed
D904 gain adjustment failed
D905 wrong position range
D906 position range exceeded

D900-Attributes

SS Display :	D9/00
Diagnostic message number :	D900

D901 Sart Only With RF

Description:

To ensure that the drive is in the loop when starting the command **P-0-0162, D9 automatic control loop setting,** such is queried at command start.

Cause:

Drive enable not set at command start (NO-RF)

Remedy:

Set drive enable and restart command.

D901-Attributes

SS Display :	D9/01
Diagnostic message number :	D901

D902 Motor Feedback Not Valid

Description:

At the start of the automatic control loop setting (**P-0-0162),** the motor parameters

- torque constant
- rated current of unit are read out of the feedback.

Cause:

One of the above feedback data has a value smaller than or equal to zero (<=0). This means that the controller parameter is incorrectly calculated.

Remedy:

If known, write the correct values back into the parameter or contact Indramat Customer Service to obtain the feedback data valid for your motor.

In the worst case, it may be necessary to replace the motor.

D902-Attributes

SS Display :	D9/02
Diagnostic message number :	D902

D903 Inertia Detection Failed

Description:

At the start of the automatic control loop setting, the load moment of inertia is determined with an "oscillation attempt".

This means that the speed change and the motor current must exceed a minimum value during acceleration or deceleration to guarantee a sensible and sufficiently precise calculation of the moment of inertia.

Cause:

- drive acceleration too low
- number of measured value too small for automatic control loop setting
- motor speed too low
- load moment of inertia too big

Remedy:

- increase bipolar torque/force value **S-0-0092**
- increase pos. accel S-0-0260
- increase pos. speed S-0-0259
- increase feedrate override S-0-0108

See also Function description: "Prerequisites for starting the automatic control loop setting"

D903-Attributes

SS Display :	D9/03
Diagnostic message number :	D903

D904 Gain Adjustment Failed

Description:

In exceptional cases, difficulties in the automatic control loop setting may arise. This means that an automatic setting is not possible. Standard or default values must therefore be loaded into the drive.

Cause:

- oscillating mechanical systems (resonance)
- high level of interference in the encoder signal

Remedy:

Satisfactory results can sometimes be achieved by starting the command **P-0-0162, D9 automatic control loop setting** with a large **P-0-0163, damping factor for automatic control loop setting**, i.e., low dynamics.

This value can be reduced until the control loop behaves as needed.

If even then control loop settings remain unsuccessful, then the setting must be manual.

Note: A manual setting should only be necessary in exceptional cases!

D904-Attributes

SS Display :	D9/04
Diagnostic message number :	D904

D905 Wrong Position Range

Description:

Before starting an automatic control loop setting, both travel range limits, i.e., upper and lower, must be defined.

When starting command **P-0-0162, D9 automatic control loop setting** the number values are automatically checked for validity. It is checked if the traversing path is large enough and if sensible values have been entered.

Possible fault causes:

- **P-0-0167, upper traversing range** smaller than **P-0-0166, lower traversing range**
- Maximum traversing path (= upper - lower limits) is less than 6 motor rotations and thus too small to start the automatic control loop setting.

Remedy:

- clear command error by ending the command
- a) input new limits whereby:upper > lower limits
  b) redefine limits to define a larger traversing range
- restart command with sensible traversing range

See also Function description: "Prerequisites for starting the automatic control loop setting"

D905-Attributes

SS Display : D9/05

Diagnostic message number : D905

D906 Position Range Exceeded

Description:

During automatic control loop setting, there is a constant monitoring of the valid traversing range **P-0-0166** and **P-0-0167**.

Cause:

If only one of these limits is exceeded, then command error **D906** is generated and the drive brought to standstill speed controlled.

Possible causes:

- actual position outside of defined traversing range
- limits redefined after command start

Remedy:

- clear command error and end command
- redefine limits so that the actual position is within defined traversing range
- retart command using sensible traversing range

See also Function description: "Prerequisites for starting the automatic control loop setting"

D906-Attributes

SS Display : D9/06

Diagnostic message number : D906

1.5 State diagnostic message

A002 Communication Phase 2

Parameter Mode

A002 Attributes

Diagnostic message number : A002

A003 Communication Phase 3

Parameter Mode

A003 Attributes

Diagnostic message number : A003

A010 Drive Halt

Description:

With the set control, the function drive halt would be activated. The drive-stop-function serves to stop the motor with a defined acceleration and defined jerk.

The acceleration or the jerk limit of the inputted position block functions during "linked block operation."

The acceleration limit and bipolar jerk value function during jogging operation and stepper motor interface.

The drive will be brought to stand still by the velocity command zero switch during torque regulation and velocity regulation.

A010 Attributes

SS Display AH

Diagnostic message number : A010

A012 Control and Power Sections Ready for Operation

Description:

The drive is supplied with control voltage and the power is switched on. The drive is ready for power delivery.

A012 Attributes

SS Display Ab

Diagnostic message number : A012

A013 Ready for Power ON

Description:

The drive is supplied with a control voltage; there are no errors in the control drive. The drive is ready to be turned on.

A013 Attributes

SS Display	bb
Diagnostic message number :	A013

A100 Drive in Torque Mode

Description:

The drive is functioning in torque mode. The drive follows the given torque command value received over the analog channels E1 and E2.

A100 Attributes

SS Display :	AF
Diagnostic message number :	A100

A101 Drive in Velocity Mode

Description:

The drive is functioning in velocity mode. The drive follows the given velocity command value received over the analog channels E1 and E2.

A101 Attributes

SS Display :	AF
Diagnostic message number :	A101

A111 Velosity Synchronisation, Real Lead Drive

Description:

The drive is in speed control. The speed command value is derived from the master axis position. The master axis position is generated from the incremental encoder signals of the master axis encoder inputs.

A111-Attributes

SS Display :	AF
Diagnostic message number :	A111

A118 Phase Synchr., Lagless, Encoder 1, Real Lead Drive

Description:

The drive is in lag-free position control. The position command value is calculated based on the master axis position which is derived from the incremental encoder signals.

A118-Attributes

SS Display : AF

Diagnostic message number : A118

A203 Position Mode

Description:

The drive is functioning in position control with Stepper interface. The device follows the position command which will be developed out of the stepper motor signals.

A203 Attributes

SS Display : AF

Diagnostic message number : A203

A204 Position Mode / Lagless Positioning

Description:

The drive is functioning in position regulation without lag/Stepper Drive interface. The device follows the position command which will be developed out of the stepper motor signals.

A204 Attributes

SS Display : AF

Diagnostic message number : A204

A206 Position Mode / POSITION Encoder 1

Description:

The drive is functioning in position regulation/Positioning drive. The drive is positioned on the selected target position with the given acceleration, velocity and jerk.

A206 Attributes

SS Display : AF

Diagnostic message number : A206

A207 Position Mode/POSITION Lagless Positioning Encoder 1

Description:

The drive is functioning in position regulation without lag/Positioning Interface. The drive is positioned on the selected target position with the given acceleration, velocity and jerk.

A207 Attributes

SS Display :	AF
Diagnostic message number :	A207

AF Control Drive Enable

The drive enable signal has been applied. The drive will follow the velocity command (normal operation)

JF Jogging in the Positive Direction

The drive moves with a jogging velocity (P-0-4030) in the positive direction. The motor is turning clockwise, when viewing the motor shaft.

JB Jogging in the Negative Direction

The drive moves with a jogging velocity (P-0-4030) in the negative direction. The motor is turning counter clockwise, when viewing the motor shaft.

Notes

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